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CONTENTS

3 FISH COLLECTING IN BELIZE
By David W. Greenfield

8 HICKORY CREEK REVISITED
By James Bland

11 HERE'S TO THE AMETHYST
By Patricia Williams

16 OUR ENVIRONMENT

17 LETTERS

22 FIELD BRIEFS

23 ENVIRONMENTAL FILMS

23 FIELDIANA

back cover JANUARY AT FIELD MUSEUM
Calendar of Coming Events

COVER

Jade censer from China; K'ang Hsi (1662-1722). Diameter 15.1 cm. Gift of Mrs. Frances Gaylord Smith. Cat. No. 232676. This censer, ornamented with mythological lion dogs and stylized plant forms, is on view in the John L. and Helen Kellogg Hall (Hall 30), second floor. Photo by Ron Testa.

The foundation of the Field Museum collection of Chinese jades was laid by the Mrs. T. B. Blackstone Expedition to China, 1908-10, under the leadership of Berthold Laufer, chief curator of anthropology from 1915 to 1934. Many additions were made by him during the Captain Marshall Field Expedition to China in 1923. The remarkable A. W. Bahr collection of archaic Chinese jades was acquired in 1926 with a fund contributed by Mrs. Frances Gaylord Smith, Mrs. John J. Borland, Miss Kate S. Buckingham, Otto C. Doering, Julius Rosenwald, Martin A. Ryerson, and Martin C. Schwab. In 1936 the Museum received the important collection of jades of the Ch'ing Dynasty and the modern period bequeathed by Mrs. Frances Gaylord Smith.

PHOTO CREDITS

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FISH Collecting In Belize

By David W. Greenfield

Tucked under Mexico's Yucatan Peninsula, and obscured even further in the jumble of Central American mini-republics, is the tiny country of Belize (until recently known as British Honduras). Slightly larger than Massachusetts, its population is relatively sparse—about 120,000. To the ichthyologist, however, Belize is of unusual interest, for its coastal waters, ponds, and rivers support a remarkable variety of fish species—a condition that may be largely explained by the country's distinctly separate areas of rain forest, woodland, savannah, and swampland.

On several occasions in recent years, we have gone to Belize to collect and study its fish life. Our longest and most fruitful work there was during the summer of 1974, when we were able to spend time in each of the principal faunal areas. Before launching into an account of our activities of that summer it may be helpful to generally describe natural features of the region and to explain why the fauna there is so diversified

Belize borders Mexico to the north, Guatemala to the west and south, and is washed by the Caribbean to the east. Among the most remarkable of the country's topographic features are the

David W. Greenfield is a Field Museum research associate and is associate professor of zoology at Northern Illinois University.

◄ *The author dons SCUBA gear before entering subterranean pool. In its waters he was to discover a new species of catfish.*

Harbor of Belize City, with fishing fleet at anchor

well-developed coral reefs, strung along much of the country's 230-mile coast. Eight to twenty-five miles offshore lies a barrier reef, second in size only to Australia's Great Barrier Reef. Between the mainland and the barrier reef there are numerous small islands, or cays, generally covered by mangrove. Further out to sea, beyond the reef, are several coral atolls, structures which occur infrequently in the tropical Atlantic.

The country's entire coastal area is bordered by mangrove swamps which often connect to inland lagoons, providing a gradation from brackish to fresh water. Northern Belize, which is flat and covered with broad expanses of savannah, has only 50 to 60 inches of rain annually; as would be expected, there are fewer rivers here than further south. From Belize City southward, the rainfall increases and the flat savannahs give way to mountains and rain forests. Hardwood forests are widespread, although much of this timber has been removed for lumber or burned down to provide space for farmland; the secondary, tangled undergrowth has resulted in dense jungle.

At Stann Creek Town, near central Belize, the average rainfall is 117 inches, while at Punta Gorda, further south, it is 167 inches. Inland from Punta Gorda, in the dense rain forest, more than 220 inches of rain fall annually.

The Maya Mountains, which angle across the southern half of Belize, constitute one of the oldest land masses in Central America and have been above sea level since the close of the Cretaceous, about 65 million years ago. The highest point in this range is Victoria Peak, with an elevation of 3,680 feet. The vegetation of the higher areas is mostly tropical pine forest. Here the streams are fast, clear, and relatively cool, sluicing through granite gorges, often with spectacular falls, some more than 1,000 feet high. Lower, the pine forest gives way to tropical hardwood. The streams and rivers are slower, larger, and considerably warmer than at higher elevations. As they wind their way down to flatter ground, they tend to become broad and muddy.

Among freshwater fish faunas of the world, Central America's is unique—a consequence largely of the geological history of the region, and in particular of changes in sea level. Until the late Pliocene (about two million years ago), South America was isolated from Central America by the sea. To the north, a seawater barrier across the area near the Pacific's Gulf of Tehauntepec separated Central America from southern Mexico. Central America remained an island for a long period; only in recent times did it connect with North and South America. Fish species which were able to tolerate sea water were able to enter and to breed in the fresh waters of Central America during the early period. Only after land bridges joined Central America to the north and south were totally freshwater species able to move into the area, but this took place in relatively recent times. As a result, totally freshwater species indigenous to North and South America are not well represented in the Central

American fauna. Central America may thus be viewed as a "filter bridge" between the two continents, with northern species moving to the south and southern species moving northward.

In discussing the history of the various species of fishes in this region, it is convenient to categorize them on the basis of their ability to cross seawater barriers. Fishes which have been confined to fresh water throughout their evolutionary history are known as *primary freshwater fishes; secondary freshwater fishes* are species that live chiefly in fresh water, but which do have some tolerance for salt water; they also have distant relatives living in the sea. *Peripheral freshwater fishes* occur in fresh water, but have great salt tolerance. These are often marine species which sometimes enter fresh water.

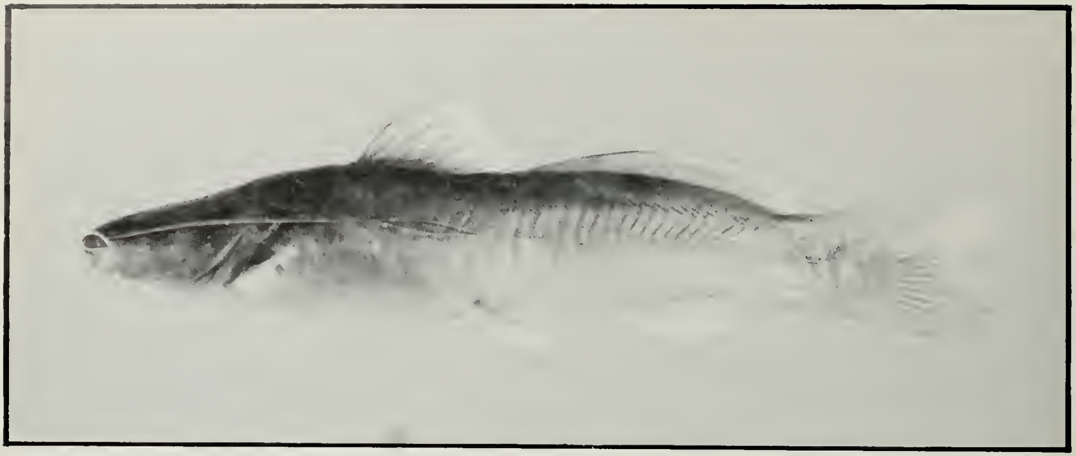
In Belize, three families of the primary freshwater category occur: characins, pimelodids, and ictalurids. There are three species of characins, each of which moved north from South America after the uplift of the Panama isthmus. The group is represented in South America by the notorious piranha and by the little tetras that are so popular with tropical fish enthusiasts. The pimelodids are catfishes, also of South American origin. Three pimelodid species, all of the genus *Rhamdia*, are represented in Belize, including a blind species never before described, which we discovered in a cave in the Maya Mountains.

The ictalurids, on the other hand, are of northern origin, and include the common catfishes found in the rivers of the United States. In Belize, the group is represented by one species, the blue catfish (*Ictalurus furcatus*), which also occurs in the Mississippi. The Belize ictalurids represent the southernmost extension of this family into Central America.

Four families of the secondary freshwater group are found in Belize: poeceliids, cyprinodontids, cichlids, and synbranchids. All of these could have crossed the seawater barrier and reached Central America at an early time. The poeciliids, or livebearers, include such familiar aquarium fishes as the swordtails and mollies. In Belize, this family is represented by 7 genera and 12 species. The cyprinodontids, or killifishes, are represented in Belize by three genera and four species. The cichlids include two genera and 14 species in Belize. Only one synbranchid, or mud eel, is found.

The peripheral freshwater fishes are by far the best represented in Belize, including 25 families and 60 species. In other parts of the world, including North and South America, the primary freshwater fishes, particularly the cyprinids (minnows) and characids, are the most numerous both in species and populations. The unusual situation in Belize—and Central America in general—is the result of the peripheral and secondary freshwater fishes being able to move into the area first, undergoing speciation, and filling many of the ecological niches. The primary freshwater fishes from North

*Terry Greenfield, the author's wife, collecting mosquito fishes (*Gambusia*) in savannah pool*



The blind cave catfish (genus Rhamdia*), a new species, discovered in subterranean pool*

and South America have not been in Central America long enough to displace the secondary and peripheral species.

We did our first collecting in the mangrove swamps adjacent to St. John's College, just outside Belize City, and were assisted by Father Leonard Dieckman, head of the college's science department. The fish fauna of these swamps is particularly interesting, since it contains representatives of all three of the freshwater groups—primary, secondary, and peripheral.

Collecting in this habitat presents special problems. Generally, the bottom is of very soft mud and has the characteristic rotten-egg smell of hydrogen sulfide. As soon as we stepped into the water we were literally up to our waists in this foul-smelling muck. Trying to seine in such a situation was difficult, to say the least. But our efforts were amply rewarded.

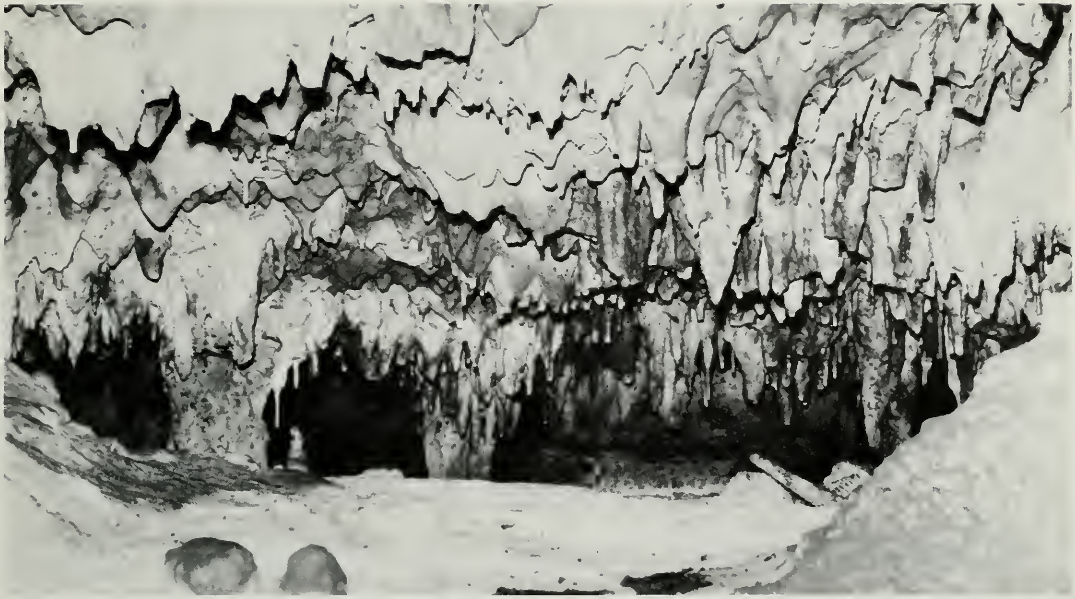
The species to be caught at any particular time often depends on the tidal cycle. At low tide, when the mangrove area is mostly fresh water, primary species such as the tetra (*Astyanax fasciatus*) and several colorful cichlid species (from the secondary group) are present. At high tide, marine species move into the mangrove areas along with the sea water. In addition to these transient inhabitants, there are several species which are able to remain despite the salinity change. This group includes such fishes as the gobies—small fishes whose pelvic fins form a sucking disc; and the silvery mojarras, whose protrusible mouths extend downward and, like aquatic vacuum cleaners, suck up food bits from the bottom. These areas also serve as a nursery ground for many marine species which remain in the mangroves until they have grown much larger. Thanks to the changing tidal conditions, it is thus possible to take more than fifty species of fishes from a single locality over a 24-hour period.

Our next collecting venture was in savannah pools outside Belize City. On this trip we were assisted by Russell Norris, a Belizean who keeps tropical fishes and who is the local expert on aquarium species.

Although they do not have extensive stream and river systems, the extensive savannahs of northern Belize have a unique fish fauna. During the rainy season many temporary ponds are formed, some covering many acres. These are generally shallow, with muddy, reedy bottoms, and are surrounded by sedges, grasses, palmetto palms, and an occasional pine or calabash tree. During periods of flooding the rivers overflow their banks, enabling fishes to move into the savannahs and populate the ponds. The fishes of these areas are mainly of the primary and secondary categories. Among the commonest fishes are the poeciliids, particularly the mosquito fishes (*Gambusia yucatana* and *G. sexradiata*). Living with the mosquito fishes is another member of the same family, the pike killifish (*Belonesox belizanus*), which is commonly imported to the United States for home aquariums. Unlike the other members of the family, which feed on invertebrates, the pike killifish eats other fishes. The slender *Belonesox*, which resembles the North American pikes, has long jaws armed with sharp, pointed teeth. Like the pike, *Belonesox* lurks motionless amidst vegetation, darting out from time to time to snatch an unwary mosquito fish.

All of the poeciliids give birth to live young. The male transfers sperm, or milt, to the female by means of a gonopodium, a modified anal fin. Once fertilized, females have been known to store milt for a year, giving birth to young every few weeks.

From Belize City we drove up to Mountain Pine Ridge, high in the Maya Mountains. The ridge is a region of steep slopes covered with hardwood forest and pine, and penetrated here and there by interesting caves. For us, the area had special memories; three years earlier we had been married in the huge Rio Frio Cave, one of the area's spectacular sights. This time we stayed at Blancaneaux Lodge, a modern resort. Nearby is a clear, swift stream which provides the lodge with drinking water and, further down, with a natural, deep swimming pool. After checking in at the lodge we



Side passage of cave (about 4 feet high) leading from the section where the blind fish were discovered.

changed into our swimming gear and swam in the beautiful pool until nightfall.

During the next few days we collected in various other nearby streams. Only four species of fish occur here: the ubiquitous tetra (*Astyanax fasciatus*), the spottail livebearer (*Heterandria bimaculata*), the slender molly (*Poecilia gracilis*), and the green swordtail (*Xiphophorus helleri*). Their occurrence in this mountain area is most interesting, since all of the streams go over falls which effectively prevent any upstream movement. At a former time, according to the geological record, the plateau atop Mountain Pine Ridge was a large lake. Later the streams—which remain today—broke through and flowed westward, draining the lake. Presumably the fishes were in the lake before it drained; they were then isolated in the streams, where they still occur.

One morning we took a bone-jarring ride in our Land Rover over tortuous trails to a cave which Rich Woods, a Belizean friend and local marine biologist, had explored some years earlier. His description of fishes that he had seen in the cave sparked our imagination, since fishes living in such dark cave waters commonly have poorly developed eyes or none at all. The cave's low entrance broadened immediately into a huge, black chamber. After a few minutes of searching the pool's dark water with flashlights, we encountered a very large number of catfish (genus *Rhamdia*), swimming back and forth from the pool just within the entrance and a narrow opening that led further back into the cave. The fish seemed undisturbed by our flashlight beams and movements, but they did respond to sound and to vibrations made at the pool surface.

We set a small seine along the bottom of the pool, with one person holding each end of the net. Then Rich would snap his fingers just above the surface. This usually aroused the curiosity of at least one fish, which swam toward the source of the sound, directly over the net; the net was then jerked up, bringing the fish with it. As we suspected, the fish was completely eyeless; only slight depressions showed where these organs had been in ancestral forms.

After collecting several of these blind fish, we decided to don SCUBA gear and try some underwater photography. The passage leading from the small pool into the larger chamber was just wide enough to squeeze through while wearing the SCUBA tank. On the other side of the hole, the pool extended into a long, sinuous chamber. Underwater, a number of catfishes as well as some blind, white shrimp could be seen swimming through the dark waters. The catfish as well as the shrimp—we learned later—had not yet been scientifically described.

Following our collecting on Mountain Pine Ridge, we headed for southern Belize. The low areas of that region, from the Belize River south, are well supplied with rivers and streams that have an abundance of primary and secondary freshwater species, as well as several peripheral species that have invaded the fresh waters. One of the larger fishes occurring here is the sharp-toothed *Brycon guatemalensis*, a characin that grows several feet long. It ranges from the Atlantic slope of Mexico southward to Panama and is fished by the Belize natives. My first encounter with this characin was while snorkeling in a river deep within a southwestern rain forest.

(Continued on p. 15.)

Above and on facing page: student participants in Field Museum's Urban Streams course spent their mornings at Hickory Creek, collecting fish and other forms of aquatic life.

"I predict that a survey of Hickory Creek fifty years hence will be so unproductive that no biologist is likely to be interested in making it." This pessimistic prophecy, made by curator of fishes Loren P. Woods in 1959 (see "A Survey of Fishes in an Illinois Stream," *Chicago Natural History Museum Bulletin*,* January, 1959), concerned a stream just 25 miles southwest of Chicago's Loop, and was predicated on the results of surveys that Woods and others had made there in the 1940s and fifties.

This past summer another survey of the stream was made by a group of high school students participating in an "Urban Streams" course, under the auspices of Field Museum's Department of Education. Hickory and its principal tributary, Marley Creek, are "prairie streams." They originate from gentle intermorainic lands in southwestern Cook County and northeastern Will County; draining a watershed of some 100 square miles, their waters eventually reach the Mississippi. Most of this land is agricultural, but recent years have seen a heavy increase in suburban residential development. Hickory and Marley drop sluggishly through an average gradient of nine feet per mile, cutting through gravel, rubble, sand, and silt that are characteristic of northeastern Illinois' glacial drift. Marley drains southward from the town of Mokena to join Hickory a short distance east of New Lenox; Hickory Creek flows westward, draining from as far east as Frankfort, Illinois. At Joliet it joins the Des Plaines River.

Hickory resembles any one of a hundred other small waterways that

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*Former name of Field Museum of Natural History Bulletin

James Bland was recently an instructor with Field Museum's Department of Education.

Hickory Creek Revisited

by James Bland

drain the Illinois Plains; but it is unique in having been studied by several scientific investigators since the turn of the century. In the early 1900s Victor Shelford, the noted ecologist, based a theory of stream succession on studies that were partly carried out on Hickory Creek. It was sampled by Alfred C. Weed (former curator of fishes at Field Museum) in the 1920s, by Hurst Shoemaker in the midthirties, by Woods and Margaret Bradbury in the forties and fifties, and by Phillip Smith in the midsixties. For many years it was the stream laboratory for ecology classes at the University of Chicago. Because Hickory's natural history has been so well documented and because it supports an unusual diversity of fishes, the creek has continued to attract interest. Currently, John Dorkin, a graduate student at the University of Illinois, Circle Campus, is completing a research project on the stream.

Dorkin has been aided in his work by students enrolled in the Museum-sponsored "Urban Streams" course. High school students from the Chicago area were selected for the course on the basis of academic achievement as well as competence in special skills such as photography and computer programming. During the first week of the course, the students received instruction in stream ecology and in field techniques. Guest experts, such as Jon Mendelson, environmental scientist at Governor's State University; Harry Nelson, of Field Museum's Division of Insects; and David McGinty, a fisheries biologist for the Cook County Forest Preserve District, provided in-depth information on stream fauna and on governmental responsibilities in the management of our streams. Following this orientation, the students spent the next three weeks seining the Marley branch of Hickory Creek (in the mornings) and sorting their collections (in the afternoons) at a field station provided by Lincoln Way High School in New Lenox. during the final week of the program, the students conducted a slide presentation on their work at Field Museum for the scientific and educational staffs. The experience has given them not only an invaluable experience in stream ecology, it has also been an opportunity for them to contribute materially to a base line study that may prove useful to planning agencies and ecologists. Through this it is hoped that the students have made a contribution to the future health of Hickory Creek.

(*Continued on p. 18*)

Here's to the Amethyst!

By Patricia M. Williams

Over the years, party-goers have developed many methods for avoiding drunkenness — some practical, some fanciful, but certainly none as decorative as the wearing of an amethyst. The name amethyst is, in fact, derived from the Greek *amethystos*, meaning "resisting drunkenness."

Unlike many modern remedies for drunkenness which must be taken internally, the amethyst was applied to the outside of the body. In the *Compleat History of Animals and Minerals* (1661), Robert Lovell explained the cure as, "Amethyst is of an attracting nature. . . .applied to the navel it first draweth the vapours of wine unto itself, and then diffuseth them, and therefore defendeth those that use it from drunkeness and surfeiting." Certainly, holding a cold stone to one's navel after a particularly festive evening might be said to be a sobering experience in itself.

Pliny the Elder was quite appreciative of the charm and uses of gems and in his *Historia Naturalis* describes a long list of fabulous stones, almost all of which possessed some kind of occult power. Not only did he cite the amethyst as a safeguard against intoxication, he also pointed out that it was a big help in warding off sorcery — if one wrote the name of the sun or moon on it and hung it around one's neck with baboons' hairs or swallows' feathers, of course. The amethyst was boosted by Pliny as being quite helpful to those who had to deal with kings, and an amethyst pendant suspended on a dog-hair cord was said to be a foolproof antidote for snakebite. As a further plus, this gem was said to do a good job of keeping off hail and locusts.

Gems of all kinds have been appreciated for their many good qualities — both real and mythical — down through the ages. In *The Story of Gems*, Herbert P. Whitlock wrote, "It is safe to assume that from the very earliest period when people began to recognize the beauty of certain stones they also ascribed to them certain supernatural properties as charms or talismans. And as far back as we can trace, they wore some material token in the form of a stone as an amulet to guard them from the ills of life, real or imaginary. The wearing of such amulets is, in all probability, older than the wearing of jewelry, and, no doubt, the one grew by insensible steps out of the other. It was essentially a natural and logical act for the primitive man who found an attractive or unusual bit of stone to ascribe to it occult powers."

Early astrologers paired each of the planets known to them with a day of the week and, later, alchemists linked these planets with minerals or metals. An astrological connection was

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Patricia M. Williams is editor of Field Museum Press.

Overleaf: Geode with amethyst crystals. Shown actual size. Weight: 10.26 kg (22 lbs, 10 oz). Discovered in San Eugenio, Uruguay. Gift of William J. Chalmers. Cat. No. M14972.

Large amethyst crystals from Thunder Bay, Ontario, Canada. Weight 2.52 kg (5 lb, 9 oz). Gift of Jerry Tricomi.

also made between signs of the zodiac and certain gemstones, as follows: ram—aquamarine, carnelian; bull—hyacinth; twins—chalcedony; crab—emerald; lion—topaz; virgin—chrysolite; balance—sardonyx; scorpion—jasper, topaz; archer—chrysoprase; goat—ruby, onyx; water-bearer—amethyst; fishes—heliotrope, tourmaline.

About the middle of the sixteenth century the concept of the stones of the months — birthstones — came about. Although the list has been revised over the years to incorporate various stones as alternatives to rare, unattractive or less durable gems, the amethyst has continued to hold its place as the stone for February.

Originally, the wearing or owning of one's birthstone was believed to bring good luck and even endow the wearer with certain capabilities, such as intelligence, honesty, or bravery. Today few would acknowledge believing in birthstones to such an extent. Yet, in the face of advanced science and technology, surpassing the age of logic and reason, calendars and jewelers' displays continue to feature lists of birthstones. The spirit of magic, of the mastery of planets and stars over our destinies is now tempered by carefully pairing each gem with a flower and capping this twosome with a solid virtue. February, then, usually carries this citation: flower—violet; birthstone—amethyst . . . sincerity.

The amethyst was not only found in the realms of astrology and metaphysics, however. This stone was held in high esteem for centuries because of its sacred uses. Amethysts were used in Egypt about 2000 B.C., frequently as funeral scarabs. In the Bible (Exodus 28) the breastplate of Judgment is described: "And you shall set in it four rows of stones. A row of sardius, topaz, and carbuncle shall be the first row; and the second row an emerald, a sapphire, and a diamond; and the third row a jacinth, an agate, and an amethyst; and the fourth row a beryl, an onyx, and a jasper; they shall be set in gold filigree. There shall be twelve stones with their names according to the names of the sons of Israel; they shall be like signets, each engraved with its name, for the twelve tribes." Again, in Revelations the amethyst is seen as one of the jewels used to adorn the foundations of the walls of the new Jerusalem.

Traditionally, amethysts have been used in ecclesiastical rings worn by bishops and other church prelates.

Obviously, above all else it is the beauty of the amethyst that has attracted man and led him to endow the stone with such a variety of qualities. Today Elizabeth Taylor's eyes are likened to lovely violet amethysts in the purple prose of the popular press. In 1652 Thomas Nicols rhapsodized that amethysts "have in them a glorious fiery brightness, which does most excellently and pleasingly dart itself forth (as I have observed in one which I was once master of) through the transparent cloud of a skie colour; from the mixture of its redness, brightness, or fiery splendor with this skie color, ariseth all the glorious delight of its pleasing tincture." (From *A Lapidary or, the history of pretious Stones: With Cautions for the Undeceiving of all those that deal with Pretious Stones.*)

More prosaically, the amethyst is a variety of quartz varying in color from a pale lilac to a deep, rich purple. Cornelius S. Hurlbut, Jr. discusses amethyst color in scientific terms in his book *Minerals and Man*, writing: "In all shades one can discover on close examination that the color is not uniformly distributed through the stone but is concentrated in thin sheets interlaminated with colorless sheets. This color layering. . .is so characteristic of amethyst that its absence should lead one to suspect an imitation.

"Chemical analyses of amethyst show it to be nearly pure SiO_2 but always containing some iron (less than 0.10 per cent). Since the amount of iron increases with increasing depth of color it is assumed that the element is the coloring agent."

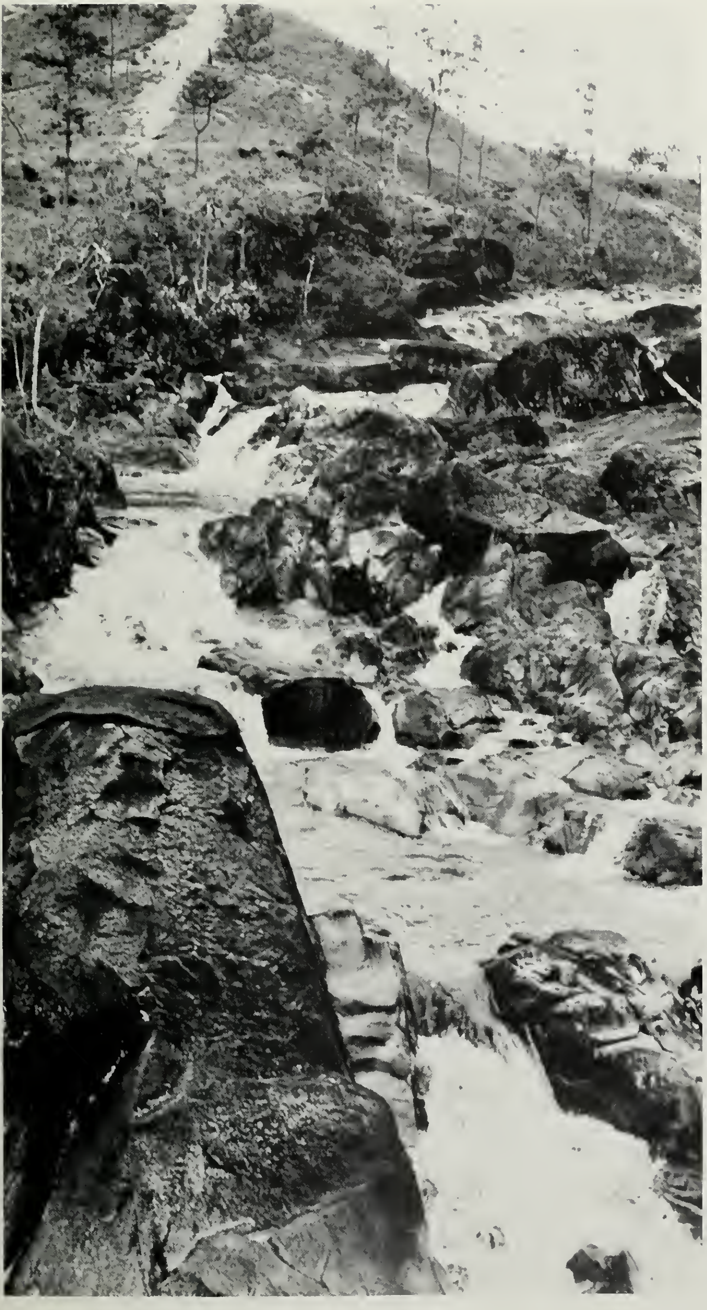
The color of the amethyst may be changed from the familiar purple to shades of red, green and smoky yellow-brown in the laboratory by heating the stone to temperatures up to 500°C. Stones marketed as "smoky topaz" may be created in this way.

The lovely facetted amethysts on display in Field Museum's Hall of Gems range in color from pale violet to a deep blue-purple and are from several geographical locations — France, Brazil, Ceylon, USSR, Ireland, Hungary, and Mexico. In *The Story of Gems* Whitlock explains, "Although amethyst colored quartz is of very common occurrence in rocks of almost every country, the deepest colored and most sought after gem material is somewhat limited to certain well-defined deposits. Russian gem amethysts, often called Siberian amethysts, are mined in several places in the Ural Mountains, notably at Mursinka, near Ekâterinburg. These stones are very deep in color, the rich purple tone being mixed with some red, a combined color which is readily recognized by one experienced in handling amethysts. Brazilian amethysts from the state of Rio Grande do Sul are also deep purple in color, as are also those from Uruguay. Fine stones have been taken from the gem gravels of Ceylon, from Madagascar and from various parts of the United States."

Geodes are round, outwardly unimpressive looking stones that are usually at least partially hollow and are often lined with beautiful, sparkling crystals. Quartz is the most common material found in the cavities of geodes— and amethyst is, of course, a variety of quartz. Geode-hunters find the sphere-shaped stones in the limestones of the Mississippi and Ohio River valleys, as well as in other areas of the United States and Mexico. The area of Rio Grande do Sul in Brazil and the adjoining part of Uruguay are known as outstanding sources for magnificent amethyst geodes. In fact, according to Paul E. Desautels (*The Mineral Kingdom*) "From Rio Grand do Sul came the most fantastic geode known — thirty-three feet in length, sixteen and a half feet in width, and ten feet in height, with an estimated weight of seventy thousand pounds. Its interior was lined with tons of beautiful purple amethyst crystals, many of them several inches across, with glittering crystal faces."

Field Museum's study collection in the Department of Geology includes several sections from amethyst-lined geodes. The largest of these weighs about 400 lbs. with dark, deep red-purple crystals.

(Continued on p. 21)



(Continued from p. 7.)

Peering under a sunken log, I was startled by the sight of several vicious-looking fish, each armed with a mouthful of large teeth. My first reaction was *piranha*! until I remembered that the piranha was confined to South America and did not occur this far north. Determined to capture one of them, we set gill nets across the river in front of the sunken log, then swam down and scared the fish into the net. Three of the larger ones became ensnared; now all we had to do was get them loose! Finally this was done, but the fish repaid us with ugly rips in the net.

The multicolored cichlids, which are abundant in this area, sometimes reach a length of a foot or more. Thirteen species of the genus *Cichlasoma*, known locally as tuba, occur in Belize. Several of these have been imported into the United States for the aquarium trade. Perhaps the best known is the firemouth cichlid (*Cichlasoma meeki*), a beautiful fish in which the lower body and the mouth interior are bright red. Only one species of the genus *Petenia* (*P. splendida*), known as the bay snook, is found. This species, identifiable by its long, pointed mouth, is an excellent sport fish; it quickly takes a lure, and is a scrappy fighter. The bay snook occurs in two color phases: most commonly it is silver with black blotches down the side. But for reasons which are unknown, some are bright red, a form especially prized by aquarists.

All of the Belize cichlids lay eggs on rocks or logs which they have cleaned off. The eggs are guarded until hatching by the parents, who fan them with their fins. After hatching, the young continue to be herded and protected by one or both of the parents.

The fishes we gathered from northern Belize differ in a variety of ways from those of the southern part of that country. From Stann Creek Town south, a number of the freshwater species that occur in the north begin to disappear; these, in turn, are gradually replaced by species common to the south. The reasons for this reversal are still not clearly understood; it is but one of many intriguing questions about the freshwater fishes of Belize that remain to be answered. ☐

Typical stream on Mountain Pine Ridge.

our environment

Additions to Endangered List

Seven American and Mexican animals, including the American crocodile, the rarest reptile in the United States, have been added to the Department of the Interior's Endangered Species List. They include the Cedros Island mule deer, the peninsular pronghorn antelope, the Hawaii creeper, the Scioto madtom, the snail darter, and the po'o uli. The bayou darter and the Newell's Manx shearwater are listed as threatened species (in trouble, but not believed in danger of imminent extinction).

The additions bring the number of U.S. endangered species to 113 and the number of threatened species to nine.

The American crocodile—Once a common species in southern Florida, it is now the rarest reptile in the United States with only ten to twenty breeding females known to exist. Intensive human development eliminated much habitat, and excessive killing by hide-hunters caused the decline. Raccoons, also prey heavily on the eggs and young of crocodiles. The possibility of a hurricane or other natural disaster is a real threat to this small, isolated population. The listing of the American crocodile comes at a time when its relative, the alligator, is being taken off the list in some areas.

Cedros Island mule deer—This deer is known only from Cedros Island, off the western coast of Lower California, in Mexico. Currently only a few, perhaps less than a dozen, are thought to survive in restricted areas of the island. Poaching and predation by packs of feral dogs are thought to be major factors in their decline.

Peninsular pronghorn antelope—This animal once inhabited most of Lower California, but has been greatly reduced in range because of excessive hunting and competition from domestic livestock for forage. Currently only two or three remnant groups survive.

Hawaii creeper—This bird was endemic to the island of Hawaii and was quite common in the 1890s. The subsequent habitat alteration, predation by rats, and disease carried by introduced birds and mosquitoes severely hurt populations. Their range is now restricted to a small area of forest between the 5,000- and 6,000-foot elevation, where they are rare and extremely vulnerable to further environmental disruption.

Scioto madtom—This fish is known only from one locality in the lower portion of Big Darby Creek, tributary to the Scioto River in Ohio. The fish has been taken in a riffle area of the creek with moderate to fast current where the bottom consists of gravel, sand, silt, and boulders. It is endangered because of pollutions, siltation of its habitat, and by two proposed impoundments on Big Darby Creek.

The snail darter, which was discovered last summer, occupies a twelve-mile stretch of the Little Tennessee River in Loudon County, Tennessee. The fish inhabits only portions of clean, gravel shoals with cool, swift, low-turbidity water. The food of the darter is almost exclusively snails which are abundant on these shoals and which also require clean gravel substrate for their survival. The Fish and Wildlife Service has determined that impoundment of water behind the Tennessee Valley Authority's proposed Tellico Dam would result in the total destruction of the snail darter's present known habitat. The dam project, underway for about 8 years, is approximately 40 percent completed.

Po'o uli—This newly discovered species of bird is restricted to a small area on the northeastern slope of Haleakala Volcano on the island of Maui, Hawaii. Its past history is unknown but presumably its decline was caused in part by habitat alteration and competition from other non-native bird species introduced on the island.

The bayou darter—A tiny, silvery fish, this darter exists only in the Bayou Pierre drainage, a small river tributary to the Mississippi River in west Mississippi. It inhabits clean, silt-free, gravel riffle areas, but in recent years gravel-pit operations and poor agricultural practices have damaged its habitat and reduced its numbers. The U.S. Soil Conservation Service has proposed a watershed project which would further affect the bayou darter's habitat by adversely altering the water chemistry and contributing additional silt to the stream. This would pose a serious threat to the continued existence of the species, according to the Fish and Wildlife Service. However, since the Corps of Engineers is currently studying the impact of the proposed watershed project, USDI wildlife biologists feel it would be premature to list the fish as an endangered species at this time.

Newell's Manx shearwater—This medium-sized black and white seabird once bred on all the main Hawaiian Islands. Now its breeding activity is restricted to an isolated part of Kauai. This fish- and squid-eating bird is thought to have been exterminated from most of its range by the introduction of predatory mongooses, dogs, pigs, and rats. The bird's attraction to light also increases its mortality as it is killed by collisions with cars and lighted towers. Nonetheless, it is thought to number in the low thousands, and does not appear to be in immediate danger of extinction.

Migrant Kirtland's Warbler

Susanne Doerger crouched beside a dead bird under the front window of her Cincinnati, Ohio, home. Awe-struck by the lifeless form, the seven-year-old girl noticed two small bands on the bird's right leg. She cuddled the bird gently and carried it to her father for some answers. The child's father recognized scientific significance in the leg bands and called a local bird bander.

The bird was identified as a male Kirtland's warbler. The species is native only to Michigan, where 358 were counted in 1975. Holding on for dear life in that state, the Kirtland's warbler is classified as an endangered species whose existence is precarious. Conservation groups have launched campaigns to help the species.

It was further determined that the dead Kirtland's warbler had been banded when ten to twelve days old on July 2, 1971, at Mack Lake, Oscoda County, Michigan. Dr. Lawrence Walkinsaw, a retired dentist who is also a recognized ornithologist, had observed the banded male on several occasions during the summer nesting periods between 1973 and 1975. He made positive identification from the bird's leg band number in live capture studies and from a blue band also placed on the bird's leg. Walkinshaw said the bird had sired at least fourteen young during the time he had observed it on its summer range in Michigan. Since the warbler winters in the Bahamas, Suzanne's bird had probably died while migrating.

Her recovery of the bird will help ornithologist assess status of the endangered species. "This is probably one of the most complete stories on an individual bird we know," said Walkinshaw. He emphasized that if people would examine dead birds for identification bands, similar valuable recoveries might be made to help scientists working with birds and endangered species.

"New" Wasp Species Loves Garbage

A "new" species of yellow jacket, *Vespula germanica*, has found its ecological niche in society's rubbish heaps and plagues residents of mid-Atlantic states during the late summer months, report Cornell University entomologists Roger A. Morse and George C. Eickwort. Almost unknown in New York state twenty years ago, the wasp has gathered forces only in recent years. It is an expert scavenger and dines on scraps of meat, ice cream drippings, and the dregs of pop bottles and beer cans. An immigrant from Europe in the early 1900s, *V. germanica* is more gregarious than its rural cousins, preferring to live in densely populated areas and build its nests in houses.

Most of the other yellow jacket species inhabiting the mid-Atlantic states are usually found in rural areas. The two or three native species that may be pests distinguish themselves by building underground nests and rarely intrude into human dwellings. Unlike bees, which feed pollen and nectar to their young, wasps raise their larvae on meat, either from other insects or from garbage or carrion.

Morse and Eickwort began to notice the new immigrant species in recent years when they received an unusual number of inquiries about stinging "bees." "Honeybees are just not that aggressive," says Morse, explaining their initial suspicion that bees were not the culprits. Sure enough, a survey of the offending insects, which were described as flying about garbage cans, old houses, and barbecue pits, revealed that 83 percent were *V. germanica*.

Morse notes that earlier surveys in the U.S. had identified this species, but found it to be rare. The Cornell survey, limited to the Ithaca area, was the first to verify that the European yellow jacket has become quite common. Other researchers have found the species as far south as Maryland and as far west as Buffalo, New York.

Cyanide for Coyotes

The Environmental Protection Agency has announced it will register sodium cyanide for use in M-44 devices to kill coyotes. There also is strong pressure on the federal government to allow experimental use of compound 1080. The U.S. District Court in Wyoming reportedly has ruled that EPA's 1972 ban on such chemicals is invalid because no environmental impact statement was filed. EPA has appealed. But in the meantime, only the presidential order prohibits the broad use of dangerous chemicals.

New Status for Alligator

Major changes in federal regulations under the Endangered Species Act of 1973, including the removal of the American alligator from endangered status in three southwest Louisiana parishes, have recently been announced by the U.S. Fish and Wildlife Service.

The new rulings, published recently in the *Federal Register*, are intended to help zoos, circuses, and other breeders of endangered species who were previously prevented from freely trading or transporting their surplus animals. Captive, self-sustaining populations of a species in the United States, which no longer constitute a drain on wild populations, may now be reclassified as threatened (not in imminent danger of extinction) even though the species is endangered in the wild. Special permits can thus be obtained for such activities as sales or shipments in interstate commerce that would otherwise be prohibited by the act. At the present time, no animals are designated as captive, self-sustaining populations. The new rules merely establish the framework for this concept; future regulations will be required to actually name specific populations of specific species as "captive, self-sustaining."

The regulations retain the alligator in the endangered category in all of its range except Cameron, Vermillion, and Calcasieu Parishes in Louisiana. While wild alligators in those parishes are neither endangered nor threatened in the biological sense, they will still be considered to be a threatened species because it is extremely difficult to distinguish them from endangered populations in surrounding areas. Outside these parishes—wherever alligators are endangered in the wild—captive populations will also be considered to be threatened under the final rules. The revised rules allow the reptile to be hunted in the three parishes in accordance with Louisiana regulations recently established to control the taking and tagging of nonendangered alligators. These regulations provide for an alligator hunting season approved and controlled by the Louisiana Wild Life and Fisheries Commission.

LETTERS

Sirs:

In the September *Bulletin*, an article "Sea Turtles in Trouble" appeared, stressing the need to adopt regulations which prohibit the taking, importation and exportation of sea turtles. It also supported a proposal to develop comprehensive turtle mariculture operations. It suggested that commercial operations of this kind would help ensure the survival of the remaining populations of these aquatic reptiles by reducing pressure from exploitation of natural nesting grounds.

The aim of this reply is to show that this assumption is overtly naive and that approval of these programs would contribute to the sea turtle's extinction instead of survival.

The chief error in this article is the assumption that turtle farming is feasible and an economically and commercially profitable venture. All evidence suggests that it is not. Pilot projects aimed at raising self-sustaining populations of green turtles have been attempted in Mexico, the Bahamas and southern Florida. Results of these efforts have not beeen encouraging. It was discovered that vast tracts of environmentally protected ocean bottom with abundant turtle grass are required. During certain times of the year when this grass does not proliferate, large amounts of supplementary food is needed. Diseases, cannibalism and skin lesions also provided handicaps which severely restricted the success of these projects. Also it found that large sums of money were necessary to sustain even a small operation.

In addition to these problems is the complete lack of success in producing fertile eggs and hatchlings under artificial conditions. Subsequently all of these pilot projects relied on wild stocks to supply their operations. It was found in some cases that nearby rookeries were severely depleted. I might add that the article in question incorrectly stated that techniques for producing completely self-sustaining populations are at hand.

If commercial turtle farms were permitted, they would obtain feral stock in the same manner as the operations mentioned above. This increased pressure might be enough to spell the doom of sea turtles.

A final point needs some mention. If commercial turtle farms did exist, a feedback system would likely be started which if not checked would most assuredly reduce sea turtles to a level beyond any hope for recovery. In order to sell their product, commercial turtle farms would find it necessary to stimulate the consumer demand by advertisement. We would likely acquire a "taste" for turtles. These "tastes" would manifest themselves in increasing demands on the mariculturalists to produce more. Since it takes four to six years to obtain a turtle at marketable value, a lag between supply and demand would result. This would cause prices to soar. With higher prices, poachers and black-marketeers would be stimulated to step-up their illegal exploitation of wild populations. The end result would mean extinction of the sea turtle.

Instead of the proposal outlined in September's *Bulletin*, I suggest the abandonment of any notions of establishing turtle maricultural operations. In order to ensure the survival of the sea turtle, legislation is needed which poses strict penalties for those attempting to import turtle products. At home, a more comprehensive effort is needed. Stretches of protected beaches must be set aside during nesting season and comprehensive conservation programs should be established in areas adversely affected by extensive seaside development.

John R. Fletemeyer
Director,
Ft. Lauderdale Marine Turtle
Conservation Headquarters
Fort Lauderdale, Florida

(Continued from p. 10)

In reviewing the results of surveys made since the early 1900s, it appears that any one of several fates is possible for a specific fish species. It might be lost from a stream entirely; yellow perch and grass pickerel, for example, have not been recorded for Hickory since Shelford's study three-quarters of a century ago. Or a species can exist marginally—avoiding the nets of those who are sampling, but nonetheless maintaining breeding populations within the stream. One of the most interesting finds of the high school students this past summer was a northern mottled sculpin. This is a bottom-dwelling fish which prefers cool, highly oxygenated, pollution-free water. It is not rare in Illinois, but this is the first time its presence has been recorded for Hickory since the early 1900s. Recent additions to the original stream fauna have included fathead minnow, carp, goldfish, largemouth bass, and black crappie. The latter two may have been stocked by local residents interested in maintaining game species in Hickory. The blacknose shiner, which is on the Illinois Department of Conservation's list of rare and endangered species, was recorded in earlier times for Hickory Creek, but has not appeared recently. Verification of these early records is among John Dorkin's tasks as he investigates Hickory Creek's history.

Several species which have vanished from other areas of the state are still to be found in Hickory and Marley. The blackstrip topminnow, for example, has disappeared elsewhere because the drainage of sloughs and marshes has destroyed much of its natural habitat But in the sedentary backwater pools of Hickory, it continues to survive. Similarly, orange-spotted sunfish, hornyhead chubs, and banded darters appear in recent Hickory collections, despite range reductions elsewhere throughout the state.

From the early 1900s until Woods' article appeared, the stream underwent but little change; its original fauna remained much the same. Despite the agricultural uses to which the stream valley had yielded, the creek had been able to maintain itself. Philip Smith, of the Illinois Natural History Survey, has analyzed the factors responsible for the disappearance of our native fish fauna; several are consequences of farming

Rate of water flow was among the variables checked along the length of Hickory Creek. Here, students adjust their simple, but sensitive, rate flow device, consisting partly of fishline and bobber.

operations, others are the effects of urbanization. According to his study, these factors are (in order of importance): silt, drainage changes, desiccation during drought, species interaction, pollution, dams and impoundments. The disappearance of eight and the decimation of sixty native Illinois species is attributed to these factors.

Our "row-crop" agriculture has caused much topsoil to be washed into the streams and, as a consequence, species intolerant of the increased siltation have been disappearing. Early in this century, Illinois farmers got together and established levee districts, thus providing a tax base to fund the drainage of lowlands and the channelization or straightening of streams. These stream modifications exacerbated the siltation problem and resulted in the alteration of many stream habitats. Prior to the Woods and Bradbury surveys, swampy lowlands near the headwaters of Hickory were drained and several reaches channelized. Despite this, there had been relatively few changes in the waterway's original complement of fishes. In the 1975 follow-up survey conducted by Dorkin and the Urban Streams students, six species previously recorded by Woods and Bradbury were not found: slender madtom, rainbow darter, bluntnose darter, fantail darter, creek chubsucker, and southern redbelly dace; a solitary stonecat was taken. Interpreting these changes as extirpations from the Hickory Creek environment is a difficult matter which must await verification by Dorkin.

A least one change—the disappearance of the slender madtom—seems directly attributable to the channelization that has taken place since 1950. These small catfish, which grow to about 7 centimeters (3 inches), lived in a very localized clay-banked habitat within Hickory. That habitat was destroyed when the stream channel was displaced from its original course. Darters are small fishes which live just off the bottom, generally on gravelly, shallow riffles areas. In the springtime, male darters take on brilliant colors in anticipation of spawning. The absence of three species of darters (rainbow, bluntnose, and fantail) may indicate that the riffles habitats within Hickory are also being degraded.

The redbelly dace is a species that has disappeared as a consequence of desiccation during drought. Headwater stream sections which formerly flowed all year long are now drying up in the droughts of late summer and early fall. This has resulted from manipulation of the water table, channelization, draining, and dredging. Species such as the redbelly dace which typically live close to the headwaters, have been most severely affected by these disturbances. Predictably, chemical changes have also occurred in the waters of Hickory Creek, and were recorded by the Urban Streams students—notably downstream from the Mokena sewage treatment plant, which discharges into the east branch of Marley Creek.

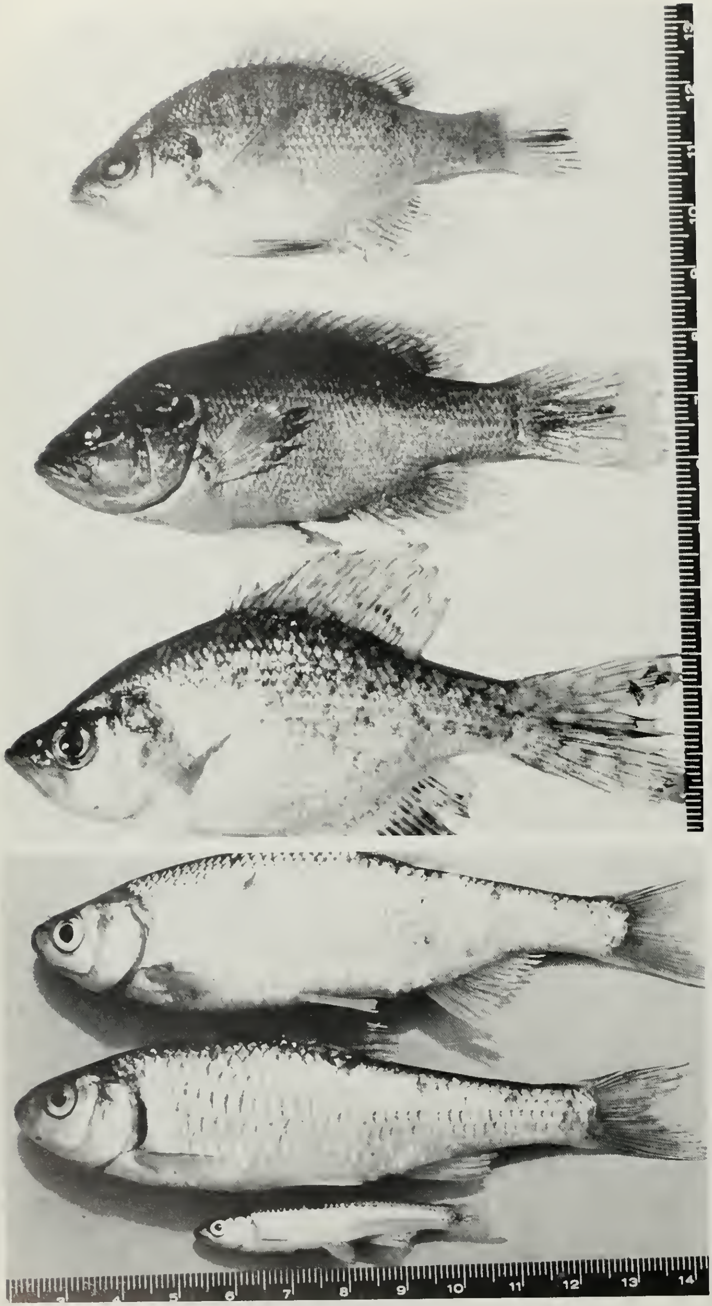
Historically, with respect to our streams, the process of urbanization has ushered in a vicious cycle. The increased demand for residential development has resulted in the use of the flood plain as a building site and the drainage of lowlands associated with streams. An increased runoff rate has occurred as vegetation areas have given way to paved roadways, parking lots, and driveways. Subsequently, residents experience flooding, followed by public demands for flood control. Typically, flood control projects involve the channelization of streams or the construction of permanent holding reservoirs. What once had been a beautiful meandering stream becomes a drainage canal. Ironically, the permanent holding reservoir performs the function that was formerly done by nature's own swamps and lowlands—now drained and vanished.

In the afternoons, the students classified and identified their specimens at a field station provided by Lincoln Way High School in New Lenox.

The effect of this cycle on the biological character of the stream is, of course, a radical one, with the destruction of many of the habitat sites that were part of the original stream. A similar situation faces Hickory Creek today. The communities of Joliet and New Lenox now experience periodic flooding as a consequence of man's interference with the local lands and waterways. Flood control measures are necessary to forestall property damage.

The Will County Planning Commission and the Illinois Division of Waterways are proposing channelization within the Joliet city limits, the purchase of green belts along the stream's flood plain, and the creation of two "dry" reservoirs elsewhere along Hickory Creek. A dry reservoir is formed by a dam which allows the stream to flow normally during periods of average water levels. During periods of peak discharge or flooding, the dam holds back the water within a reservoir created out of the stream valley. Thus, the reservoir is dry most of the year and does not have the substantial impact on the stream that a permanent reservoir has. The first of these structures, the Sauk Trail Reservoir, is scheduled for construction this year east of Frankfort.

The task of conserving a natural community such as a prairie or a stream is never a simple matter. Although the public is taking an increasingly more sophisticated attitude toward environmental problems, it is still common to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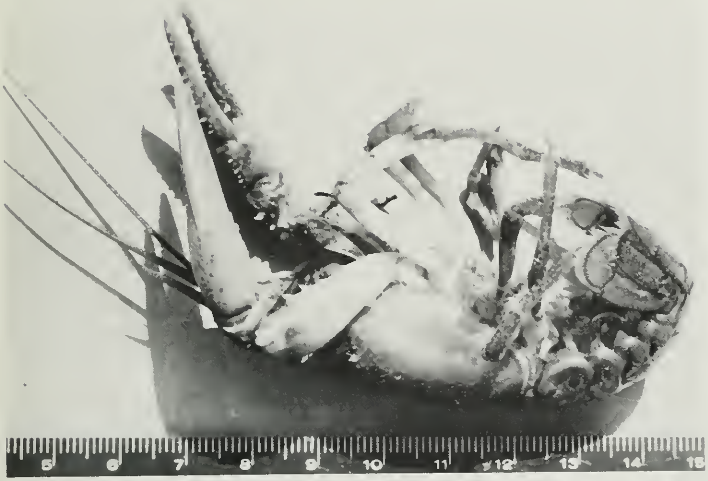
Fish species collected in Hickory Creek included (top to bottom): bluegill, green sunfish, black crappie, golden shiner, common shiner, and sand shiner. (Scale is in centimeters.)



Crayfish—still a common inhabitant of Hickory Creek

encounter persons who ask "What good is it?" in reference to the sandhill crane or Kirtland's warbler or a prairie or a stream. The question is usually a sincere one. The difficulty comes in trying to phase a satisfactory reply; and, in attempting to do so, it seems that one must lead into abstractions. A developer can point to tax receipts, housing, and other benefits to the community and be assured that the public will understand in what ways he intends to develop the property. There is, however, no simple, direct way of explaining the importance of prairies or streams as genetic warehouses, as laboratories of community processes, or as living museums of our natural heritage. The listener must either have a high degree of biological sophistication or he must be patiently led to understand the basics of "environmental quality" and all that term implies. With respect to a prairie, for example, a certain appreciation can be developed out of aesthetic experiences. However, most of our small tributary steams have always been murky and silt-laden, even in pre-agricultural times. Thus, the biological diversity of the stream is less visible to the casual observer, and likely to escape all but the specialist's scrutiny.

It is hoped that the unique natural history of Hickory Creek will in the future be considered by those charged with the difficult task of managing this environment. It is a problem made no less difficult by the fact that the rate of change in the biological character of Hickory Creek is accelerating. We have thirty years in which to prove Loren Woods' prophecy wrong, and the important options are still open to us. ☐

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(*Continued from p. 14.*)

"Wow! A 400 lb. cluster of amethysts. That must be worth a king's ransom, right? Wrong. Amethysts do not rank high in any jeweler's list of precious gems. Although the *Encyclopaedia Brittanica* states that "The prime requisite for a gem is that it must be beautiful," —and the amethyst is clearly that — there is more to establishing the monetary value of a jewel than beauty.

There is general agreement that in addition to being beautiful, usually a stone must have transparency, a certain degree of hardness and a rarity of occurrence. The amethyst does meet the first three qualifications, but it is not particularly rare. Following the old law of supply and demand, when large amounts of amethyst were discovered in Brazil and Uruguay at the beginning of the nineteenth century, the bottom dropped out of the amethyst market.

The amethyst may not be a good hedge against inflation; it may not really prevent drunkenness or ward off hailstones; it may not endow one with sincerity. The amethyst is, however, an indisputable wonder of natural beauty in its richness of color and the precision of its crystal shapes. Pliny the Elder referred to all gems — but no less to amethysts — when he wrote, "In gemstones the whole majesty of nature is compressed into the smallest space, and in a single stone we can perceive the masterpiece of creation." ☐

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field briefs

BICENTENNIAL AWARD FOR MUSEUM

On the occasion of the November 9 press preview of Field Museum's new exhibit, "Man in His Environment," federal, state, and city officials were among the first exhibit viewers. A certificate of recognition was presented to the Museum by the Chicago Bicentennial Committee. Above, Museum Director E. LeLand Webber (left) chats with Richard J. Daley, mayor of the City of Chicago (center) and Chicago Alderman Michael A. Bilandic, chairman, City Council Committee on Finance.

The new exhibit, which opened to the public on November 11, has been acclaimed as one of the most effective public expressions by a scientific institution on the condition of the environment.

NEW STAFF MEMBERS

The Division of Insects has recently appointed Eric Smith as custodian of the insect collection; Warren Loschky has joined the Museum as manager of the Book Shop.

Dr. Smith, a specialist in the Chrysomelidae (leaf beetles), is a native of Cincinnati, Ohio, and received his doctorate from Ohio State University.

Mr. Loschky received his B.S. in business administration from the University of Missouri and most recently was with Sears, Roebuck and Company.

DEPARTMENT CHAIRMEN NAMED

Edward J Olsen and Phillip H. Lewis have been appointed as chairmen of the departments of geology and anthropology, respectively; the appointments became effective December 1. Both men had been serving as acting chairman prior to appointment.

Dr. Olsen, a native Chicagoan, joined Field Museum as associate curator of mineralogy in 1960. In 1961 he was made curator. Dr. Lewis, also from Chicago, joined the staff in 1957 as assistant curator of primitive art. In 1960 he was made associate curator and in 1961 he became curator; his present curatorial position is curator of Melanesian ethnology. Dr. Olsen did both his undergraduate and graduate work at the University of Chicago. Dr. Lewis received his B.F.A. from the Art Institute of Chicago and did his graduate work in anthropology at the University of Chicago.

VORIS SPEAKS AT KENNICOTT CLUB

At the January 6 (Tuesday) meeting of the Kennicott Club (7:30 p.m. at Field Museum), Harold Voris, assistant curator of reptiles and amphibians, will talk on his recent collecting experiences in Southeast Asia. Dr. Voris spent several months in 1975 collecting and studying sea snakes in the Straits of Malacca. Guests are welcome to the meeting.

environmental films

In conjunction with the *Man in His Environment* exhibit, which opened November 9, a series of films are being offered by the Department of Education; each deals with a specific environmental problem or topic not dealt with in the exhibit. The selection of films represents a distillation of more than 350 considered for the series. Screenings will be in the Meeting Room, second floor north, on Fridays, Saturdays, and Sundays at 11:00 a.m. and again at 1:00 p.m.

JANUARY	The Vanishing Wilderness: Films by Shelley Grossman, film producer for Field Museum's Man in His Environment exhibit, that deal with a variety of ecosystems and the political, economic, and social changes that must occur if wilderness areas are to be saved. Jan. 2, 3, 4 "*Of Broccoli and Pelicans and Celery and Seals.*" Nov. 9, 10, 11 "*Chain of Life.*" Jan. 16, 17, 18 "*No Room for Wilderness.*" Jan. 23, 24, 25 "*Santa Barbara—Everyone's Mistake.*" Jan. 30, 31, Feb. 1 "*Will the Gator Glades Survive?*"
FEBRUARY	Human Alternatives: Key environmental problems that we now must face. Feb. 6, 7, 8 "*Pollution—A Matter of Choice.*" Feb. 13, 14, 15 "*Multiply and Subdue the Earth.*" Feb. 20, 21, 22 "*The Great Sea Farm,*" "*Should Oceans Meet?*" Feb. 27, 28, 29 "*But Is This Progress?*"
MARCH	The Question of Tomorrow: Documentary and fantasy versions of what the future can hold for us. March 5, 6, 7 "*Future Shock,*" Feb. 12, 13, 14 "*The Unexplained.*" March 19, 20, 21 "*Technology: Catastrophe or Commitment,*" "*Urbanissimo.*" March 26, 27, 28 "Energy to Burn," "*Man in the Second Industrial Revolution.*"

FIELDIANA

Fieldiana is a continuing series of scientific papers and monographs dealing with anthropology, botany, zoology, and geology; the series is intended primarily for exchange-distribution to museums, libraries, and universities, but is also available for public purchase.

The following titles were published during 1975 and may be ordered from the Division of Publications. Members are entitled to a 10 percent discount. Publication number should accompany order.

Fieldiana Anthropology

"Chapters in the Prehistory of Arizona," by Paul S. Martin, et al. Vol. 65, No. 2; 174 pp. Publication 1201. Price: $9.25.

Fieldiana Zoology:

"Notes on Rodents of the Genus *Gerbillus*," by Douglas M. Lay. Vol. 65, No. 2; 8; 13 pp. Publication 1213. Write for price.

"An Additional New *Stenus* from Australia (Coleoptera, Staphylinidae)," by Volker Puthz. Vol. 65, No. 7; 4 pp. Publication 1212. Price: 75c.

"Millipeds of the Genus *Polydesmorhachis* Pocock (Polydesmida: Platyrhacidae)," by Richard L. Hoffman. Vol. 65, No. 6; 12 pp. Publication 1207. Price: $1.00.

Fieldiana Botany:

"Flora of Guatemala, Rubiaceae," by Paul C. Standley and Louis O. Williams. Vol 24, Part XI, Nos. 1 to 3; 274 pp. Publication 1202. Price: $8.75.

"Tropical American Plants, XVII," by Louis O. Williams. Vol. 36, No. 10; 34 pp. Publication 1210. Price $1.50.

"Austral Hepaticae III; Stolonophora, A New Genus of Geocalycaceae," by John J. Engel and R.M. Schuster. Vol. 36, No. 11; 14 pp. Publication 1208. Price: $1.00.

"Notes on Calvatia (Lycoperdaceae), I," by Patricio Ponce De Leon. Vol. 38, No. 1; 3 pp. Publication 1215. Write for price

Fieldiana Geology:

"The Mammalian Fauna of Madura Cave, Western Australia; Part II," by Ernest L. Lundelius, Jr. and William D. Turnbull. Vol. 31, No. 2; 81 pp. Publications 1209. Price: $1.25.

"Pyritic Cone-In-Cone Concretions," by Bertram G. Woodland. Vol. 33, No. 7; 15 pp. Publication 1200. Price: $1.25.

"The Mammalian Fauna of Warwasi Rock Shelter, West-central Iran," by Priscilla F. Turnbull. Vol. 33, No. 8; 15 pp. Publication 1204. Price: $1.25.

"Phylogeny of the Chelydrid Turtles: A study of Shared Derived Characters in the Skull," by Eugene S. Gaffney. Vol. 33, No. 9; 22 pp. Publication 1205. Price: $1.50.

"Time Factors of Differentially Preserved Wood In Two Calcitic Concretions in Pennyslvania Black Shale from Indiana," by Bertram G. Woodland and Catherine K. Richardson. Vol. 33, No. 10; 14 pp. Publication 1206. Price: $1.25.

"Geochronology, Stratigraphy, and Typology," by John Andrew Wilson. Vol. 33, No. 11; 12 pp. Publication 1211. Price: $1.00.

"Phosphatic Microfossils from the Ordovician of the United States," by Matthew H. Nitecki, Raymond C. Gutschick, and John E. Repetski. Vol. 25, No. 1; 9 pp. Publication 1214. Write for price.

"Caryocrinitidae (Echinodermata: Rhombifera) of the Laurel Limestone of Southeastern Indiana," by T.J. Frest. Vol. 30, No. 4; 26 pp. Publication 1203. Price: $1.50.

JANUARY at Field Museum

NEW PROGRAMS AND EXHIBITS

ADULT EDUCATION

NONCREDIT COURSES for ages 18 and over in the natural sciences and anthropology. The winter courses run simultaneously and are offered on six consecutive Thursday evenings, 7-9 p.m., beginning January 15: ***Taxonomy and Natural History of Aquarium Fishes, Meteorites and the Solar System, Archaeology of Ancient Egypt, Native American Folklore***, and ***Man in His Environment.*** Registration limited to 30 persons per course. Member's fee: $25; nonmembers: $30. For further information call Adult Education Programs, 922-9410, ext. 351.

CONTINUING PROGRAMS AND EXHIBITS

ESKIMO ART EXHIBIT

19TH CENTURY ALASKAN ESKIMO ART exhibit in Hall 27. In the language of the Eskimo there is no word for "art." Yet art was inseparable from Eskimo life, especially among the peoples of the Bering Sea area in the late 19th and early 20th centuries, and the most commonplace articles were fashioned and decorated in ways that are aesthetically beautiful.

Most of the examples of northwest Alaskan Eskimo art, featured in this exhibit, were acquired by the Field Museum in the 1890s during the first decade of its existence. They include tools, weapons, household utensils, religious, and ceremonial artifacts, and they exemplify the skill of the traditional Eskimo who used available tools and limited raw materials (caribou antler, driftwood, walrus tusk ivory, and baleen) to depict the world around him.

BICENTENNIAL EXHIBIT

MAN IN HIS ENVIRONMENT, a major new permanent exhibit in a major new exhibition hall. This dramatic, 8,000-square-foot exhibition (two movie theatres plus four areas of three-dimensional displays) explores nature's magnificent system of checks and balances and man's dependence on this system. The exhibit also deals with man's activities and his effects on the quality of life on our planet, and asks visitors to consider the implications for our earth's future.

The exhibit is part of a comprehensive program involving a traveling ***Man in His Environment*** exhibit and a series of related museum programs to run well into 1977. (See ***Environment The Sum of its Parts*** below.)

ENVIRONMENT FILM SERIES

ENVIRONMENT: THE SUM OF ITS PARTS, offered in conjunction with the ***Man in His Environment*** exhibit. The January series, "The Vanishing Wilderness," deals with a variety of ecosystems and the political, economic, and social changes that must occur if wilderness areas are to be saved. Films are shown at 11:00 a.m. and 1:00 p.m. in the Meeting Room, second floor north. Series continues through spring, 1976.

Jan. 2, 3, 4: ***Of Broccoli and Pelicans and Celery and Seals*** (30 min.)
Jan. 9, 10, 11: ***Chain of Life*** (30 min.)
Jan. 16, 17, 18: ***No Room for Wilderness*** (26 min.)
Jan. 23, 24, 25: ***Santa Barbara—Everyone's Mistake*** (30 min.)
Jan. 30, 31, Feb. 1: ***Will the Gator Glades Survive?*** (30 min.)

ESKIMO FILM PROGRAM

CONTEMPORARY CANADIAN ESKIMO ART AND ARTISTS are illustrated in three films which can be seen daily at 12:00 noon. For location, inquire at entrances. The films are:

Eskimo in Life and Legend (23 min.)

Eskimo Artist Kenojuak (19 min.)

Kalvak (20 min.)

SATURDAY DISCOVERY PROGRAMS

NEW PROGRAMS have been added to the continuous stream of tours, demonstrations, and participatory activities offered every Saturday, from 11:00 a.m. to 3:00 p.m., as part of the museum's Discovery Program. They are: (1) ***Eskimo Art and Culture***—A film and tour that explores the relationships between traditional Eskimo art and culture, and examines the ways in which Eskimos adapted to changes in the modern world. (2) ***Tibet***—Learn about magic and mystery in the culture of Tibet. (3) ***Traditions in Chinese Art***—A half-hour tour traces the origins and development of Chinese art styles.

Other Discovery Programs include the popular clay dinosaur modeling in the Hall of Dinosaurs (take your model home), and the half-hour tour through the Egyptian collection—which also explains the "how's" and "why's" of mummy-making.

For specific programs and locations, inquire at entrances.

WINTER JOURNEY FOR CHILDREN

NOMADS OF THE MYSTIC MOUNTAINS, a free, self-guided tour through the museum's colorful Tibet exhibit. All children who can read and write are invited to participate. Journey sheets in English and Spanish are available at the information booth. Bring pen or pencil.

WEAVING DEMONSTRATIONS

THE ANCIENT ART OF WEAVING on a two-harness, handcrafted Mexican floor loom, demonstrated by members of the North Shore Weavers' Guild, resumes January 12. Demonstrations are every Monday, Wednesday, and Friday, 10:30-11:30 a.m. and 12:00-1:00 p.m. On Monday, January 19, the demonstrations include spinning. South Lounge, second floor.

JANUARY HOURS

THE MUSEUM opens daily at 9:00 a.m. and closes at 4:00 p.m. weekdays, and 5:00 p.m. weekends. On Fridays, year-round, the museum is open to 9:00 p.m. Food service areas are open weekdays 11:00 a.m. to 3:00 p.m.; Saturdays and Sundays to 4:00 p.m.

THE MUSEUM LIBRARY is open 9:00 a.m. to 4:00 p.m. Monday through Friday. Please obtain pass at reception desk, first floor north.

MUSEUM TELEPHONE: 922-9410

February
1976

Field Museum of Natural History Bulletin

Field Museum of Natural History Bulletin

February, 1976
Vol. 47, No. 2

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Founded 1893

Director: E. Leland Webber

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CONTENTS

3 AN ANTHROPOLOGIST IN CHINA
Curator Berthold Laufer's 1923 Expedition:
His Report to the Director

10 GEORGE LANGFORD, 1876-1964
Curator of Fossil Plants
By Eugene S. Richardson

12 TREES OF STONE
By Edward Olsen

18 46 YEARS AGO
Field Museum in 1930

20 FOCUS: PEOPLE IN THE MAINSTREAM
Illustrated Lecture Series for Spring

21 WINTER WINDUP
Wednesday Evening Slide-Lectures

22 FIELD BRIEFS

23 FEBRUARY AT FIELD MUSEUM
Calendar of Coming Events

COVER

View of the Black Forest in the wilderness area of Petrified Forest National Park, in eastern Arizona. Photo by John and Janet Kolar. The Kolar's photographic expedition to the Southwest was funded by a gift from Mr. and Mrs. Joseph J. Morand, Jr. For more on petrification see page 12.

BACK COVER

Cross section of petrified tree trunk; shown about one-half actual size. Photo by Ron Testa.

PHOTOS

Pages 3-10; staff photos; 12: John Kolar; 14-22: staff photos

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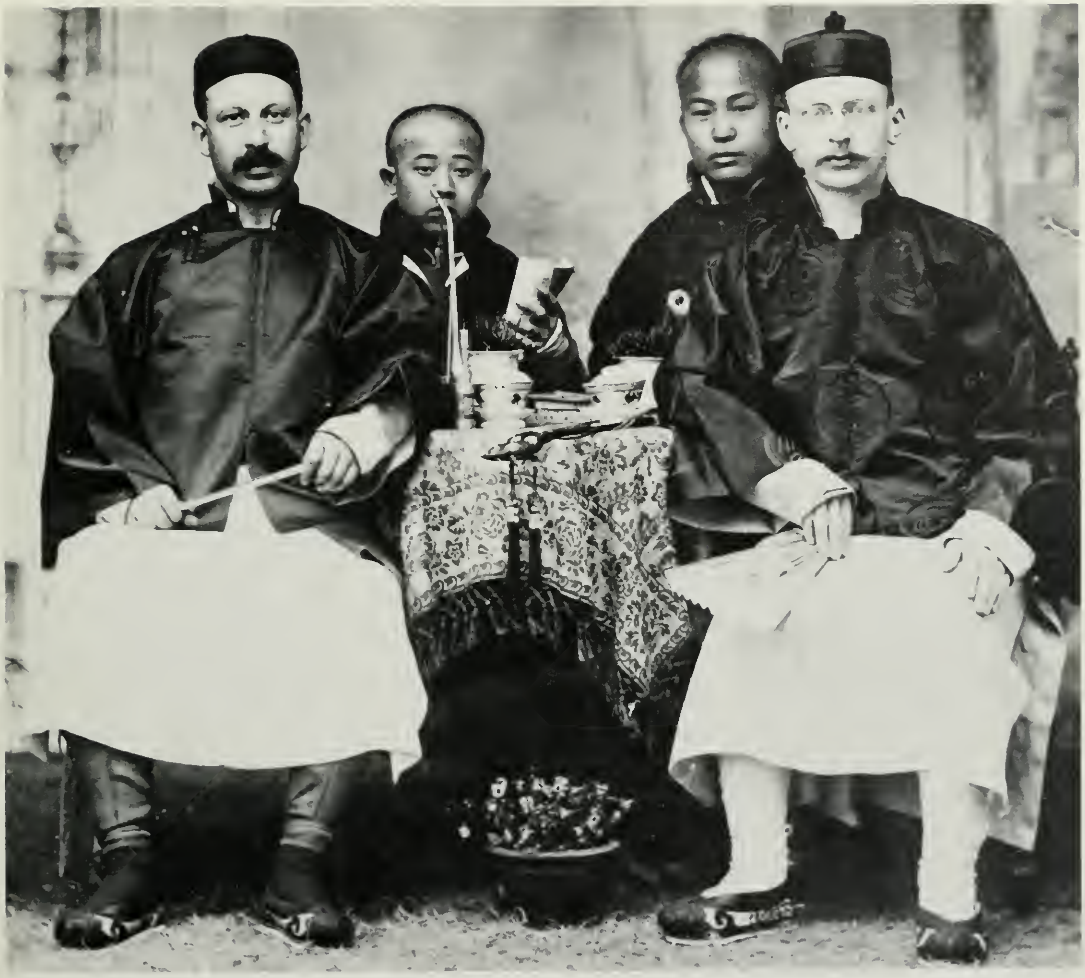


Berthold Laufer (right) in Chinese garb on earlier visit to China (1904).

An Anthropologist in China

Curator Berthold Laufer's 1923 Expedition: His Report to the Director

Berthold Laufer, curator of the Department of Anthropology from 1915 until 1934, was one of the most distinguished anthropologists of his time, and his prolific writings on Far Eastern peoples are remarkable as much for their diversity as for their scholarship. Laufer was also a gifted linguist and was skilled in Chinese, Japanese, Manchu, Mongol, Tibetan, Pali, Sanskrit, Malay, and Persian, to say nothing of the principal European languages.

While with Field Museum Laufer made two trips to the Far East, during which he collected hundreds of rare artifacts which today comprise the backbone of the Far Eastern collection. The first of his trips, from 1908 to 1910, was treated in an article in the June, 1974, *Bulletin*. The following report deals with his final visit to China in 1923.—*Ed.*

October 26, 1923

Mr D C Davies,
Director, Field Museum
of Natural History

Dear Sir:

I have the honor to submit a report on the Museum Expedition to China.

Following is a brief sketch of my itinerary I spent four weeks at Shanghai, collecting, studying, and gathering information, and on the 11th of June preceeded by rail to Peking, [where] my activity was largely confined. Following an invitation of our Ambassador, Dr. [Jacob G.] Schurman, I accompanied him July 13-16 on a tour to the Buddhist cave-temples of Yunkang. I left Peking on the 23rd of August and reached Shanghai on the 25th, visited Hangchow, capital of Chekiang Province, . . . and Suchow, capital of Kiangsu Province, . . .spending the remainder of my time at Shanghai until the 4th of October when I returned on "President McKinley" to Seattle, landing in the afternoon of the 20th of October I took the next train to Chicago, arriving at the Union Station on the evening of october 23, having covered approximately 17,223 miles

Since the time I left China in October, 1910, the entire situation has undergone a rapid and radical change. The republican government proclaimed in 1911 resulted in the overthrow of the Manchu dynasty and in the extermination of the whole cultural structure built up by the former monarchical regime. Old conservative China, as still witnessed by me in 1901-4 and 1908-10, has collapsed, and is no longer in existence. It has gradually surrendered to a large influx of western ideas The ancient culture is in a complete state of disintegration, giving way to the manufactured articles of America and Europe, and in many respects has irrevocably vanished To cite but a few examples—foreign shoes, socks and hats are generally worn to such an extent that it is difficult, and frequently only after a diligent search in out-of-the-way places, to find those articles of really native make

Most of the tools used in native crafts are replaced by those of American manufacture, thus, the time-honored Chinese razor and carpenter's tools have disappeared Machinery is employed for weaving cotton and silk. In pottery, brass and tin foreign articles are imitated, and even foreign designs are freely applied to them The old-style silver and gold jewelry has fallen out of fashion to make room for a mania for imported diamonds, rubies and rings. Hence I came more and more to the conclusion that during the first decade of this century I had unconsciously performed an act of rescue-work by securing numerous then modern objects which are now unobtainable and may thus be classified as antiques

While what twenty years ago might have been termed the ethnology of China has succumbed, with a few exceptions, the situation in regard to antiques also has changed to a marked degree. The difficulties in getting hold of good material have increased a hundredfold, and prices have risen a thousand per cent and more. What I was able to do in 1908-10 cannot now be accomplished any more. Nothing like the collection of ancient sculpture in the Museum can be obtained at present; also numerous bronzes and types of pottery, particularly the Han pottery, it would be impossible now to duplicate. At present the trade in antiques is concentrated at Shanghai and Peking, and nothing is to be had in the interior The chief supporters of this movement who derive the greatest advantage from it are the officials who form a sort of invisible trust and maintain digging agents in all parts of the country. On making a remarkable discovery, these agents have to pay considerable fees. . . to the local farmers, soldiers, and officials before getting a permit to take their spoils out of the particular province; and it frequently happens, as quite recently in Honan, that monumental pieces are simply seized and confiscated by the provincial governors Considering, further, that heavy likin or intraprovincial and intraurban transit dues are exacted on all highroads and in traveling from town to town, and that the diggers may have to travel and work for many months without any chance of success, it is obvious that any good object, on reaching the markets of Shanghai or Peking, is already heavily mortgaged; and, as the demand exceeds the supply, and as Japanese collectors who have a profound appreciation of Chinese art are always willing to pay

◄ *Porcelaneous jar. Sung Dynasty (A.D. 960-1280). Cat. No. 127008. This and other artifacts shown on following pages were collected by Laufer in 1923.*

extraordinary prices, we are confronted with a situation of seemingly exorbitant quotations. . . .

Shanghai, in particular, is an inexhaustible field for the collector. This was not the case some twenty years ago. The revolution of 1911 brought this change about. At that time numerous officials faithful to the reigning house and disgusted with the new republican government retired to Shanghai to live there in seclusion with their art-treasures. In consequence of rebellion and civil war raging in all parts of the country during the republican era, thousands of people, especially from Canton, flocked to Shanghai in order to enjoy safety and protection of their property under the administration of the foreign settlements. These facts account for the immeasurable wealth amassed in that city and the countless art-treasures to be found there. More than half of Chinese art that has survived the ravages of time, war, and bandits is nowadays concentrated and sheltered in Shanghai.

Shanghai and Peking, however, are at present not only the centres for the trade in antiques; but they are also the emporiums for all goods manufactured throughout the empire. In order to obtain certain articles, it is neither necessary nor advisable or sensible to visit the places where these are made, as without the additional expense of traveling, transportation, and overland duty they can be obtained at much lower figures in Shanghai or Peking. . . I had in mind to pay a short visit to Fuchow in Fukien with a view of securing some specimens of modern lacquerware which form a specialty of that place, but several friends called my attention to the fact that this would be an unprofitable proposition, as nothing else was to be had at Fuchow and as any quantity of Fuchow lacquer is offered for sale at Shanghai.

The first plan of campaign I had mapped out was to take the railroad from Peking to Sui-yuan on the border of Mongolia and to travel from there overland southward to Si-an fu, my second home, which I had visited in 1902 and again in 1909 and 1910. I received, however, the following information from Mr. E.T.S. Newman, for the last four years post-master of Si-an and an old friend of mine, himself a collector, who had spent a lifetime in the government services of China. Under date of the 22nd of May he wrote me as follows: "I don't think it advisable to pay Sian a visit for the province is very unsettled and it is very difficult to get anything worth having and besides it is more difficult to get it away, if you ever do succeed in getting anything worth having. From Kwanyintang to Sian the road at present is simply infested with. . . bandits. There are hardly anyone travelling along the road these days for fear of being taken for ransom.

"There are no pictures to be had at present in Sian, as the bandits have destroyed practically everything in this line. I tried hard to get some good pictures during the four years I was there but did not succeed, except in one instance I picked up a good picture of "The Re-incarnation" said to be of the "Sung dynasty" painted on paper. I saw hundreds but they were all faked and not worth having."

This information was sufficient to determine me to desist from a journey to Si-an.

I shall not dilate on the bandit situation and the far-reaching consequences it had for all foreigners in China, as the facts in the case are well known and were widely discussed in the press the world over. Needless to say that the representatives of the foreign governments duly warned their nationals and that the Peking Government declined any responsibility for the lives and property of aliens travelling through bandit-infested regions, a long list of which was promulgated. There was no escape from the conclusion that under such circumstances serious and fruitful work in the interior could not be pursued. While I felt that my knowledge of the language and familiarity with native customs and manners would enable me to cope with the exigencies of the most difficult situation and that a little encounter with brigands might infuse into my journey the spice of adventure or thrilling experiences of a personal nature, I felt, on the other hand, that I was not an independent person *sui juris*, but that it was my primary duty to act as a loyal steward to my trustees by safeguarding the funds which were entrusted to me and for the expenditure of which I was fully responsible.

I had to reflect, further, that in case of any mishaps resulting in the loss of money or collections I should be compelled to face the situation squarely and make full restitution to the Museum for any losses incurred, while unfortunately I would not be in a position to do so, even if the Museum had given me a written assurance absolving me from all responsibility in such a contingency, this would not have relieved my mind or altered my sense of personal obligation or my conception of responsibility. The principal consideration to be made, of course, was that a valuable collection, if abstracted or destroyed, could not even be replaced or duplicated, and such a loss would naturally have driven me to despair or broken my heart. I discussed the whole question with [Ambassador] Schurman and he frankly expressed his assent to my attitude.

The archaeological survey of Fukien Province which I had contemplated and foreshadowed in my report submitted to you on February 26 of this year could not be carried out on account of constant warfare going on within the borders of that province and beyond between the contending factions of the North and South and the operations of organized bands of brigands. I was fully posted on the situation over there through Chinese officials from that province whom I saw in Peking, and through reports of my friend A. de C. Sowerby who attempted to enter the territory. Following is an extract from one of his reports published in the *North-China Daily News*. It makes a very interesting contribution to present conditions.

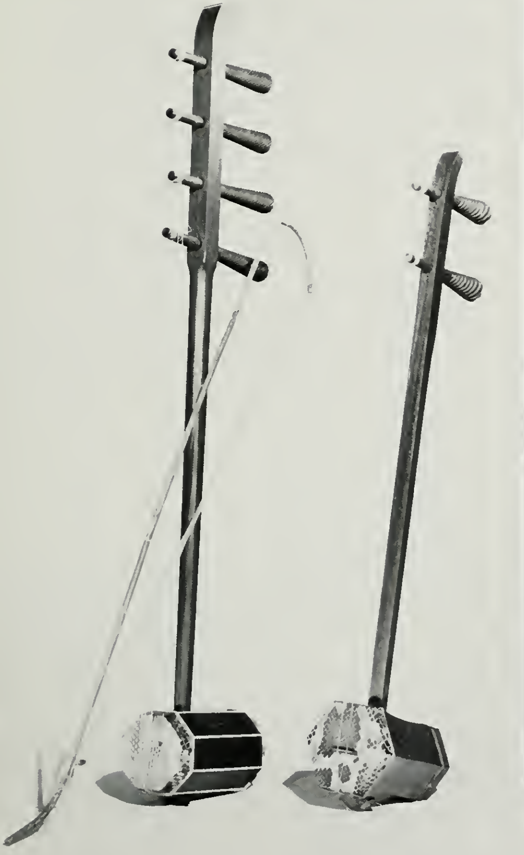
"And when one thinks of all this is going on down on that plain, the way the wretched military are press-ganging the more miserable inhabitants, and after taking them miles and even days away from their homes turning them adrift, exhausted, without food, or any means of getting back, often shooting them or bayoneting them in sheer wantonness, it makes one's blood boil. Between here and Hinghua after the operations of last winter, when the southerners were driven out, they found the dead bodies of 28 coolies lying on the road, where the troops had left them after having bayoneted them when they were too exhausted to carry their loads any further. In the same place an old woman who tried to persuade the soldiers not to impress her son was bayoneted and thrown out into the street. These soldiers, northern as well as southern, are utterly without reason, mercy or even common humanity. They met a foreigner travelling in a chair, and took his coolies, both the chair coolies and the load coolies, and when he protested they told him that they would shoot him if he did not shut up. He suggested that there might be trouble if they did, and their reply was that there would be no proof that they had done it, and so they did not care. That is what foreign prestige has come to in China. They know that if they did do it to a foreigner, little or nothing would come of it, since our own nations no longer seem to value our lives, rights, or property, while such mere trifles as insults are certainly not to be considered seriously.

"One of the highest officials here in Foochow remarked to a foreigner that the soldiers did not need money, as their rifles were their cheque books. I suppose it is on this supposition that the military Tuchuns appropriate the soldiers' pay, after having extracted it from local merchants, and when they have enough skip to some Treaty Port, where they are given protection by the very foreigners that they flout, and bank their ill-gotten gains safely away in foreign banks, leaving their soldiers to draw money at the point of the bayonet from the twice robbed inhabitants. One cannot help feeling that if safe asylum were not given to these thieves they would be less inclined to risk stealing public money in this way, as after all they are a cowardly lot, and value their hides even more than the money. One of the recent military governors of Foochow decided that it was time to seek safety in flight, so he collected large sums of money from the people to pay the troops. These he deposited in a bank. Next he paid up all the soldiers with cheques, but before they could cash these, he drew out the money from the bank, boarded a north-bound vessel, and reached Shanghai. . . and there he is safe. Thus he staved off the demands of the soldiers while he made his get-away, and but for the strong action of a famous Admiral here, the soldiers would have turned on the people and looted them. It says volumes when the people tell you that they infinitely prefer the bandits that infest the province to the soldiers, yet that is just the case."

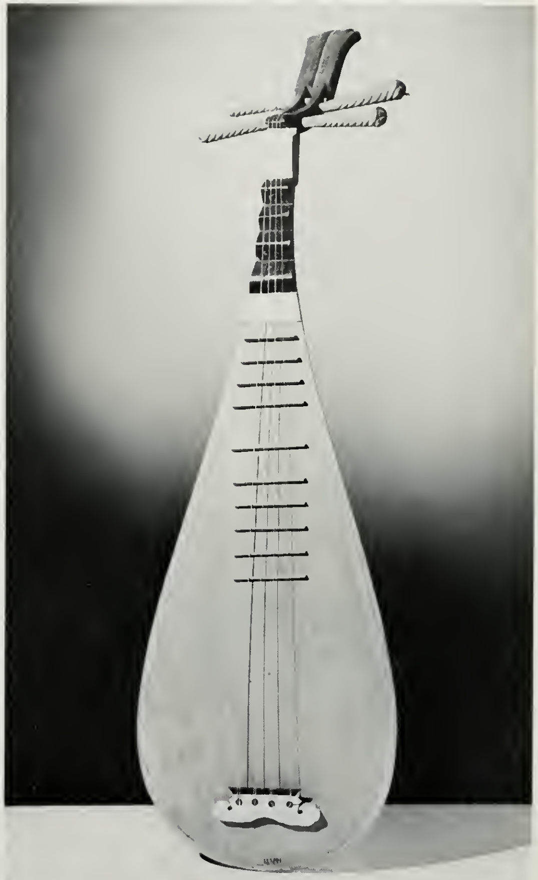
After a careful and conscientious survey of the situation, as outlined above, I arrived at the conclusion that travelling in China was one thing and collecting another thing, that the two could not be combined to advantage at this time, and that in the present stage it was more urgent and important to collect whatever could still be had; hence I decided to invest the substance of my appropriation in first-class and worth-while exhibitable material. Any trip into the interior of even short duration would have involved a heavy expenditure in equipments (as cots, bedding and provisions) and the engagement of at least three servants, and in view of the risk of such a venture I felt I was not justified in assuming the burden of this expense.

Having been for years an exponent of the principle of quality versus quantity, I resolved to make a test case of this principle and apply it to myself. May others decide in how far I have succeeded. In framing my plans I excluded at the outset those departments of Chinese culture which are well represented in the Museum, as Han pottery, Buddhism and Taoism, sculpture, etc., in order to concentrate on such groups of objects or such periods as are still lacking or deficient. I also proceeded according to a calculation of probabilities: being thoroughly familiar with the field I knew with a fair degree of exactness what objects were getting scarce or scarcer, or what objects were still plentiful or would still turn up in the future; thus I bought first, or invested more heavily in things which threaten fast to disappear, and gave secondary consideration to those which remain more or less stationary or may reasonably be expected to stay. The exhibition point of view remained uppermost in my mind, and I always carried in my mind a clear

Pandean pipe of mottled bamboo. Ch'ing Dynasty. Cat. No. 127549. On exhibit in Hall 32, Case 39.



Four- and two-stringed fiddles. Ch'ing Dynasty. Cat. Nos. 127543, 127544.



Four-stringed guitar. Ch'ing Dynasty. Four strings represent the four seasons. Cat. No. 127541.

picture of the future exhibition as I visualized it, assigning to each novel acquisition its proper place within this scheme; if it failed to fit into it, I would rather reject it, but this contingency very seldom arose. This methodical plan supported by my long and intensified experience with the field enabled me to proceed with full steam ahead and accomplish within a comparatively brief span of time what I had set out to do. Moreover, in view of the fact that I put in an average working day of sixteen hours inclusive of Sundays and holidays, I virtually had much more time at my command than it would appear at the surface from a cold computation of a period of five months that I was on duty there.

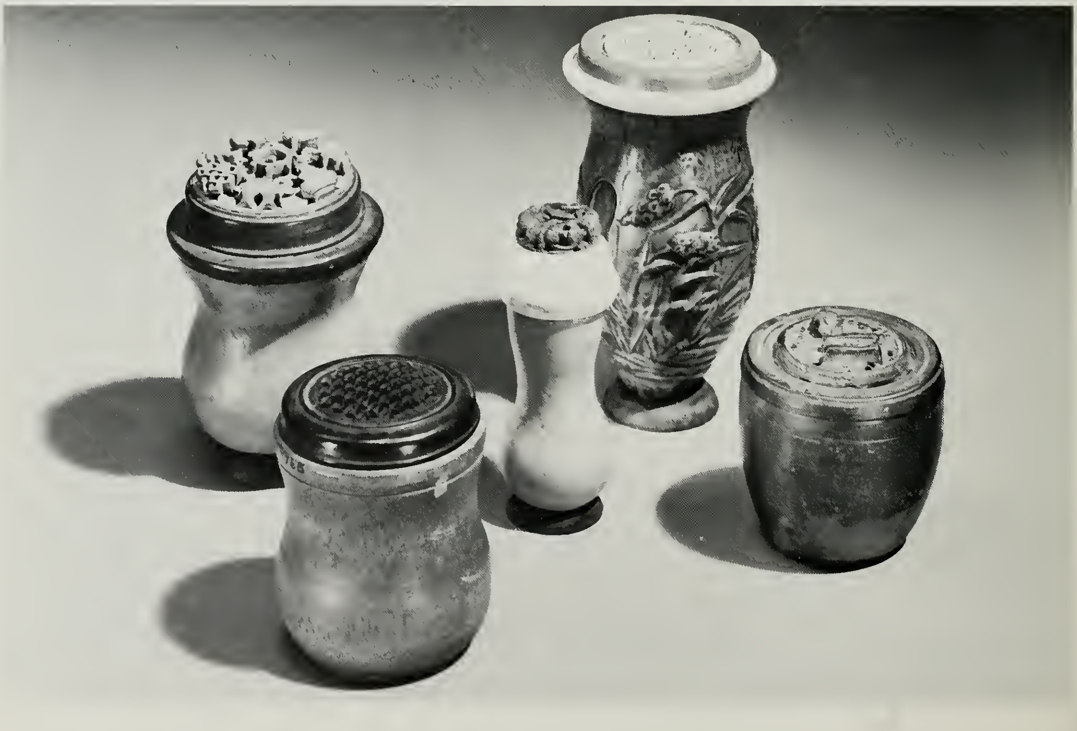
The most striking and spectacular exhibition objects obtained for the Museum are a large imposing red-lacquered bed adorned with numberless wood-carvings; of the kien-lung period (1736-95), 8.4 x 14 feet in dimensions and 8 feet in height, forming a veritable room in itself, an hexagonal red-lacquer and painted wash-stand with lacquer wash-basin and provided with a tall carved background, a red-lacquered and elaborately carved bridal chair or palanquin of the same period in which the bride, on the day of marriage, is carried into the bridegroom's house; and a large dragon-boat of the same character and period, which is carried around in religious processions at the annual dragon-boat festival; finally a red-lacquered chair painted with five-clawed dragons from the palace of the King emperors. . . .

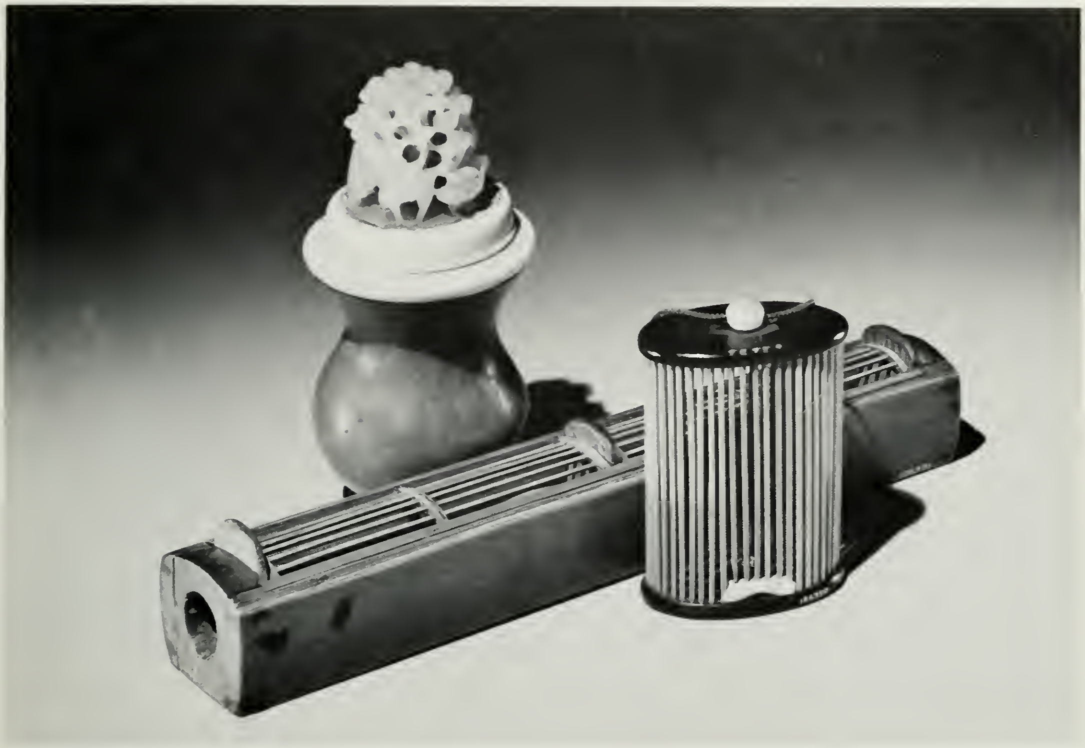
It is no exaggeration to say that [the bed] is a perfect marvel of technical skill and labor coupled with rare artistic taste. Only two or three such first-class beds are still in existence in China. They were only made at Ningpo, the famed centre of furniture manufacture. My Chinese friends in Shanghai sent agents to Ningpo who after several months' search and inquiry among old families brought the above pieces to light and transported them to Shanghai. At first they showed me an inferior bed,. . . but after close inspection I decided that it was not good enough . . ., and rejected it. . . Thus they returned to Ningpo and within the lapse of a week came forward with the above article which proved satisfactory. It is a well-established business policy of the Chinese first to show and palm off on the unwary customer goods of inferior or trashy character and to withhold or hold back the really good stuff for special occasions. One has to know this trick in order to get along with them, not by offering criticism which would be contrary to etiquette and hurt their feelings (and they are very sensitive people), but by moral persuasion and an appeal to their sense of fair play and honor, which will never fail. In my case I had no difficulties whatever, as they were not slow in discovering that I knew and what I knew, and being aware that what I wanted was to go on exhibition in a public museum of America, they evinced intelligent sympathy and sincere desire to serve the objects of so good a cause. For this reason my standing with them was widely different from that of the ordinary collector or commercial buyer, and many men were proud of hunting for good things on my behalf and granting special discounts to the Museum.

Most of the men engaged in the sale of antiques represent as high a type of businessman as any to be found in England or our own country. It should not be imagined that the antiques in my collection are things publicly exposed for sale, nothing of the kind is encountered in the shops, which at present display merely beautiful trash of no interest to me, spurious objects or out-and-out fakes. What I was able to secure comes from the possession of old families or from private collections, or is directly the result of excavations carried out by Chinese . . .

With respect to the mode of exhibition of the bridal palanquin, it may certainly be shown as it is, even outside of a case, but I also have a wider scheme which merits consideration. The idea is to make it the center of a group consisting of two life-size figures: the bride at the moment when she has stepped out of the palanquin, and the bridegroom appearing in the door of his house coming out to meet her. The difficulty is to find at present the old style bridal costumes which certainly ought to be of the period corresponding with that of the palanquin . . . .

Containers for captured crickets. Ch'ing Dynasty. Left to right: cricket gourd with sandalwood cover; cover has eight Buddhist emblems in high relief; wheel in center; Cat. No. 126376. Bamboo cricket box with wooden cover; Cat. No. 127765. Cricket gourd with ivory rim; top is stained green and is carved in high relief with lotus blossoms and leaves. Molded cricket gourd with ivory rim and cover; design is of quail in millet; Cat. No. 127703. Cricket jar of black pottery; relief design on cover represents lion on pedestal. Cat. No. 127724.





Insect traps and cages: (rear) cricket gourd with ivory rim and white jade top; Cat. No. 126415; (center) bamboo box for catching crickets; Cat. No. 126391; (front) bamboo cage and trap; top and bottom are of black lacquered wood; used for catching insects to be fed to wrens; Cat. No. 126390.

A capital acquisition is constituted by a large number of relics of the Manchu dynasty, pre-eminently four imperial dresses of the eighteenth century—an imperial yellow official dragon-coat of tapestry, an embroidered yellow dragon coat worn in imperial worship, a blue dragon coat used by an imperial prince, and the yellow silk dress of an empress, consisting of an inner and an outer garment; several elaborate head-dresses of princesses composed of blue kingfisher feathers in applique work and interspersed with jade ornaments and precious stones and hats of emperor and princes; . . . the armor of a Manchu general from the Kang-hi period (1662-1722); [and] a complete series of the bow used by the Manchu in military examinations for testing the strength of candidates; . . . .

Last August while I was at Peking, it transpired that a portion of the palace buildings inhabited by the young emperor, Suan-tung, were at night destroyed by fire and numerous art-treasures, books and documents fell victims to the flames. Rumor had it that the conflagration was of incendiary origin, having been started by the palace eunuchs to cover the theft of other art-objects they had previously disposed of to foreigners. Be this as it may, the emperor fired a host of eunuchs in consequence of this fire, and during the following weeks the police were busy raiding private houses which were alleged to serve as hiding-places for the abstracted imperial property. Several people addressed to me directly or indirectly the question whether I was in any way connected with this affair; I certainly was not and with an emphatic denial protested to such a vile insinuation. I can assure you confidentially that the articles enumerated above were rescued from the palace by Manchu and Chinese officials in the republican revolution of 1911 and were acquired by me from their bona fide owners through perfectly lawful transactions.

In the former collection the Sung period (10th-13th century) was not adequately represented. This was the age of the Renaissance of China in which the traditions of classical antiquity were revived and the foundations were laid to a truly national art. Pottery, poetry and painting then reached the climax of development, and the productions of this period served as the high models to the artists of the subsequent dynasties. I spared no pains to make a collection as representative as possible of the pottery

(Continued on p. 14)

George Langford

1876–1964

On the centennial of his birth, a glance at the remarkable life of a former curator of fossil plants

By Eugene S. Richardson

George Langford with fossil plant specimens

George Langford had many strings to his bow He was an engineer, an athlete, an artist, an author, a fossil collector, a genealogist—and also historian, poet, archaeologist, and inventor Consequently, when he retired in 1946 from a long career in the steel business, he was able to shift, at the age of 71, to one of his other careers. It was then that he came to Field Museum, where he held the post of curator of fossil plants until his retirement in January 1962.

George was born in Denver on May 26, 1876, of a family long engaged in iron founding Grandfather George Langford had established at Utica, New York, the first iron works west of the Hudson River. Before the Mohawk River and the Erie Canal were combined to introduce economies of transportation, this pioneer of the industry carried his ore in a backpack and denuded the local hardwood forest to make charcoal. His son, Augustine G. Langford, George's father, continued west and was equally hard on the forests near Denver. There, in partnership with a man named Marshall, the second Langford ironmaster operated the first blast furnace in the Rockies, where he refined a very low grade of ore to make cannon during the Civil War for the Union Army.

Young George watched every aspect of the iron-making, even going down into the mine with his father or with Mr. Byerley, an associate Fifty years later, in the early 1930s, George returned from Illinois to his childhood haunts. The blast furnace was long gone, but he found the village of Marshall, named for his father's former partner In that town he also found his old friend Byerley. Before George spoke, the old man asked, "Is your name Langford?"—for the family resemblance was strong.

Byerley showed George the creek on whose banks the foundry had once glowed, but even he had forgotten exactly where it had been. George, employing his fossil-collecting and archaeological talents, found the site by following traces of brick and iron in the stream At a point where no further clues led him upstream, he secured permission to dig, and found three pigs of cast iron, rusted but still sound

When George was nine years old his father suddenly died, and the reduced family moved from Denver to St. Paul to be with his mother's people, the Robertsons. It was in his grandfather's library that George first read and studied the botanical monographs of Lesquereux and Brongniart and the paleontological works of Marsh, Cope, and Leidy. Ever after, he shuddered when he recalled that on his grandfather's death in 1895, when George was away at college, the library and his grandfather's files of correspondence with American and European botanists had been sold as scrap paper.

In the fall of 1894, George entered the Sheffield Scientific School at Yale

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Eugene S Richardson is curator of fossil invertebrates.

University, as an engineering student. He attempted to enroll in O.C. Marsh's paleontology course, but it was given in the college and not open to Sheffield students. He found the lack of formal training in paleontology a serious drawback in his later career as a paleobotanist.

Upon graduation, George was offered a job by E.W. McKenna, a railroad man in Milwaukee. McKenna had developed a process for hot-rolling railroad rails that had deteriorated with use, to restore them to service. George was to be engineer and draftsman in the Joliet plant. Soon, however, he was thinking up ways to improve the process. In time, he secured over a hundred patents, both for processing rails and for accessories concerned with railroading. It was typical of his many interests that he once turned in an application for a patent, in the name of Chellean Man, on a stone scraper complete with specifications and engineering drawings. The U.S. Patent Office enjoyed the jest and published it in their journal.

At this period he was loaned a rail-crew handcar by the Illinois Central Railroad, and used it to visit roadcuts to collect from fossiliferous exposures.

As the McKenna Process Company developed, George was given the responsibility of establishing branch plants in Kansas City, Kansas (1897), and Elizabeth New Jersey (1898), in addition to the original mill, which had been built in Joliet, Illinois, in 1895. Then in 1904 he was sent to Liverpool, England, to build a rolling mill across the Mersey at Birkenhead. At each of these places he stayed long enough to get the plants operating, and of course spent his free hours in the surrounding countryside, collecting fossils.

Early in 1900, in the Joliet plant, George lost his left arm. While he was inspecting a machine, his sleeve was caught between two slow-moving gears and his hand was drawn into the teeth. While he held onto a pillar with his legs and other arm, the entire left arm was pulled off at the shoulder. He was hurried into a cart, which headed for the hospital, across a railroad siding. But a halted freight was blocking the track, and it took twenty minutes for his rescuers to have a coupling opened to let them through. The Joliet hospital patched him up and then sent him to his family in St. Paul, "to die," as he told it.

At this time, George was engaged to a girl he had met a few years earlier in Kansas City, Sydney Holmes. She came to St. Paul to see him while he was recovering and he offered her a chance to end the engagement if she felt she wouldn't be getting full measure. She wouldn't hear of such a thing, and on November 14, 1900, they were married. Soon their home in Joliet was a center for those interested in art, in gardening, and in natural history. In time, George and Sydney had a son and a daughter, George and Lyda.

Substantially recovered from his accident, George began frequenting nearby strip mines and the "Fisher Mounds." At the latter location he preserved a record of the locality from destruction by an advancing gravel pit. George persuaded Fay-Cooper Cole, professor of anthropology at the University of Chicago, that the site was important, and for two summers Cole and a group of graduate students worked on the mounds and the lodge pits with George. Several of the young men who helped in this dig became leading anthropologists in the next generation. George published his description of the site in the *Transactions of the Illinois Academy of Science*, and deposited his share of the bones and implements with the university.

But it is with the strip mines, which he first visited in 1937, that George is particularly associated in the memory of his Museum colleagues. Though the first visit was disappointing, George returned many times, and he soon was establishing a large and remarkable collection of the fossil plants and animals found in ironstone concretions in the spoil heaps. Many of these species were new to science.

In order to make the beautifully preserved fossil fronds more attractive to members of Mrs. Langford's garden club, George devised a means of "developing" them with a water-thin coat of a dextrin solution. Many of the other collectors in the Chicago area still use his method, and their collections, like George's, exhale a subtle fragrance of dextrin. Many years later, George estimated that he had collected 250,000 concretion specimens; of these he kept only the best—about a tenth of the total.

By the time of World War II, George had become president of the McKenna Process Company, still in Joliet. Because of a dispute with the national government over the free use of his patents by other mills, the firm was enjoined from operating and George himself was indicted for monopolistic practices. Without normal updating of the machinery, the company could not survive and in 1945 George closed it and left Joliet.

George had already begun to give his massive collections of fossils and artifacts to permanent institutions. Partial mastodon skeletons from Minooka, Illinois—once the major decoration of the second-floor hallway in the Langfords' home, moved to the Field Museum. Small collections of fossil plants from the strip mines went to a dozen colleges, and a major collection to the Illinois State Museum, but the largest portion went to the Field Museum. Then the Langfords sold the Joliet house, piled into their small Ford, and set out on a vacation visit to Yellowstone and other long-remembered favorite spots. Naturally, George couldn't resist gathering a few fossils along the way.

On their return, this time to an apartment in Chicago, George was for the first time without a fossil collection and without an occupation. He received permission to come to the Field Museum to curate his former specimens. In 1947, at the age of 71, he began his second full-time career as assistant in fossil plants; three years later he was appointed curator of fossil plants. During the next year he spent 32 days collecting in the strip mines for the Museum, and he continued such trips until 1959. In this period he also made several long trips with Museum colleagues to collect fossil plants in Tennessee, Mississippi, and Alabama. Before his next retirement, in 1962, George wrote and illustrated two collecting guides to the fossils of the strip mines.

George died suddenly, in Chicago, on June 16, 1964, at the age of 88. ☐

TREES OF STONE

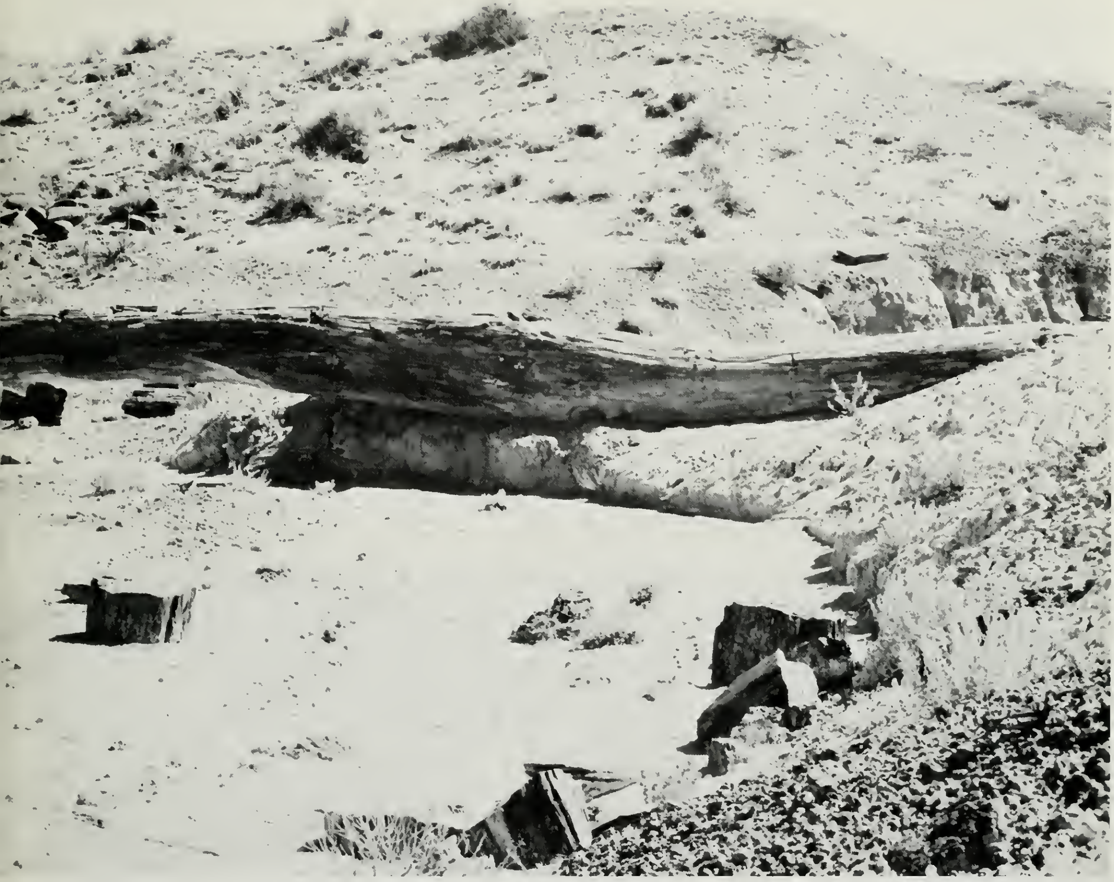
By Edward Olsen

Petrification is the name we give to the process by which fossil organic remains are turned to stone. Strictly speaking, it is only one example of the geological process called *replacement*, by which any object—fossil or mineral—is replaced by another mineral in a manner such that the form or shape of the original object is preserved well enough to recognize what it was. There are hundreds of examples of replacement, such as the sharp, cube-shaped crystals of pyrite ("fool's gold") that are completely replaced by the mineral hematite. In this example the original mineral, pyrite, an iron and sulfur compound (FeS_2) is replaced by an iron-oxygen compound (Fe_2O_3). In a case like this, in mineralogical jargon, we say that the hematite is a *pseudomorph after* pyrite. Pseudomorph comes from Greek and means "false" (*pseudo*) "form" (*morph*).

Probably the examples of replacement that interest people most are the petrifications of fossil remains. This process—in fact, the whole process of replacement—is only poorly understood. It is usually a highly selective process. There are some fossil shell limestones in which only certain fossil shells are beautifully replaced by silica, and none of the others. Every detail of the fossil is faithfully reproduced in silica, a compound of silicon and oxygen (SiO_2). The original shells were made of calcite, a calcium-carbon-oxygen compound ($CaCO_3$), which was then replaced by the silica. Petrification of fossil remains doesn't always come off perfectly, however, and numerous examples exist where the original shape is recognizable, although somewhat misshapen.

One of the finest examples of petrification is that of wood by silica.

Edward Olsen is curator of mineralogy and chairman of the Department of Geology.



View of the "Onyx Bridge" in the wilderness area of Petrified Forest National Park in eastern Arizona. About 175 million years ago the Onyx Bridge—remarkable for its unbroken length—was the trunk of a living tree. Photo by John Kolar.

Most often the wood form is recognizable, but small details are lost in the process. In some cases, however, every minute detail of the fossil wood is beautifully duplicated in silica: the bark with all its furrows and crenulations, the cellular structure of the original woody fibers, and the annual growth rings. In such perfect examples it is possible to identify the species of tree and to tell how many years it lived. The specimen shown in cross-section on the back cover is an example of such preservation. Other specimens may be seen in Hall 35.

Petrified wood occurs worldwide, most often as small groups of petrified logs or fragments of logs. A most spectacular example occurs as a whole petrified forest of logs, such as the Petrified Forest in eastern Arizona. The cover photo and the above view are of that region. Petrified wood, expecially that showing details of former woody structures, are much in demand by lapidary workers and make attractive polished ornamental stones.

The petrification of woody material was apparently accomplished when trees were covered by sediments or volcanic debris, ground water, rich in dissolved silica, then slowly dissolved away the woody cellulose compounds and replaced them with silica. How delicate structures are preserved in such a process is puzzling. In many cases, however, such details are lost and the resulting petrified log is amorphous and structureless, only the loglike shape being retained.

Possibly the first written record of mineral petrification is the Old Testament account of the fate of Lot's wife:

> "But his wife looked back
> from behind him, and she became a pillar of salt." Genesis:
> 19,26

This would be, mineralogically speaking, a halite pseudomorph after a human being □

(Cont'd from p. 9)

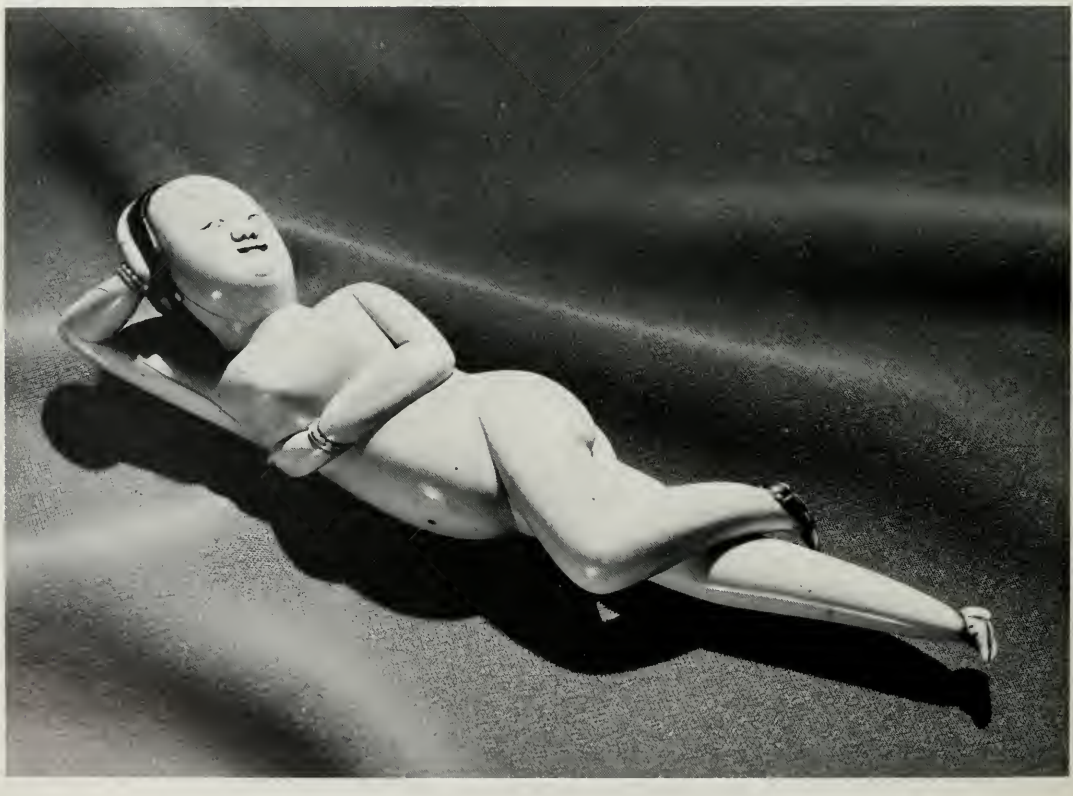
and porcelain of this epoch and succeeded in bringing 133 pieces together. In A.D. 1108 the city of Ku-lu in the southern part of the province of Chili was inundated by a flood and completely submerged. Some years ago the farmers of a neighboring village, driven by famine conditions, began to dig in this place and brought to light a lot of Sung pottery and other objects. Excavations were continued under the supervision of government officials, and a large collection was transmitted to Peking, where it is housed in the Museum of the Historical Association. I acquired a goodly number of this pottery, some of great beauty, and inscribed with dates, aside from its artistic value, it is apt to illustrate many interesting features of the daily life in a mediaeval Chinese community. It can be safely dated, since all these pieces must have been made prior to A.D. 1108, the date of the destruction of the town.

I also obtained from the same locality four carved wooden panels and a number of engraved wooden stamps or blocks for printing designs on textiles, these are not only the oldest printing-blocks we now have, but also the earliest wooden objects ever found in China, as anything of this material has perished in consequence of the ravages of the climate and weather.

My former collection of Sung pottery was restricted to the kilns of Yao-chou in Shansi Province. The present collection includes types from all kilns and localities of both northern and southern China, where pottery was then manufactured. It is distinguished by elegant shapes, beautiful glazes of all colors, and exquisite designs. It is the most artistic pottery ever turned out, not only in China, but anywhere. I obtained three of the very earliest products which are extremely rare and, as far as I know, are not represented in any other museum of America; [one] of these shows the famous glaze called "the blue of the sky after rain", and is a gem.

Ancient paintings are at present most difficult to obtain, the best being naturally held in public and private collections. On my former expedition I had confined my attention to the painting of the Ming and Manchu dynasties (16th to 18th centuries) with particular stress on subjects of ethnological interest. This time I resolved to

Ivory figure of reclining woman used in consultation with physician for indicating area of ailment; 18th century. Length: 18.5 cm. Cat. No. 126832.



get hold, if possible, of some representative examples of paintings of the Sung and Yuan periods (10th to 13th centuries), the great era of pictorial art. Many opportunities offered to acquire first-class paintings of this kind, but these were . . . beyond my reach. I had to limit my selection . . . to those obtainable at reasonable figures, and my object was to have each important subject of pictorial art efficiently represented rather than to be guided by schools or names of artists.

From this viewpoint I chose, for instance, a characteristic landscape, a snow and a rain picture, a bamboo sketch, a study of flowers and birds, portraits, and religious subjects of that epoch. Though small in number (23), these pictures are all of superior quality, interesting in subject, and highly instructive as manifestations of Chinese genius during the culminating period of art development. A life-size portrait of a sage and the counterpart to it, the portrait of a dwarf who appeared before an emperor of the Sung dynasty and caused a sensation owing to his enormous capacity for wine, a long roll depicting Hundred Beauties in a delicate style, another roll showing portraits of Sixty Women famed in history, another representing 25 figures of beggars, minstrels and other itinerant folks, are of especial interest for the study of ancient customs and costume. I was fortunate to secure two original works from the hand of the renowned painter Chao Mong-fu, a descendant of the imperial house of Sung—an historical scene and nine horses, he was a recognized master in horses, and of all the horses by him I have seen, this one is doubtless the best.

Woven pictures or tapestries are still scarcer than paintings. Here, again, fate treated me kindly by allotting to me five remarkable examples, one of the Ming dynasty and four of the Kien-lung period (1736-95). One of these emanates from the imperial collections and represents two fowls drawn by the Emperor Kienlung himself after a Sung dynasty painting and accompanied by a poem from his hand—the whole in facsimile being woven in silk. . .

With a few exceptions, lacquer ware, a most important industry of China, was almost absent in the former collection. Altogether 84 specimens of this character were obtained, . . . among these, four of the earliest carved lacquers of the Ming dynasty. They exhibit a great variety of objects in boxes, baskets, chests, trays, cabinet-doors, dishes, bowls, trays, and vases, in black and colored lace, carved or painted with landscapes and designs in colors or gold, or inlaid with scenes and ornaments in mother-o'-pearl . . .

Many additions were made to the collection of Jades, the new accessions amounting to 185 specimens. Three tubes of enormous size, symbolizing the deity Earth, large knives and disks, an astronomical instrument of which in my publication on Jade* I was able to reproduce merely a Chinese woodcut, and a very comprehensive lot of prehistoric or very archaic jade and other stone implements, are deserving of particular mention. A representative collection of small carvings, chiefly pendants and snuff-bottles, of the eighteenth century includes, as far as material is concerned, jade, rock-crystal, turquois, tourmaline, malachite, lapis lazuli, agate of many varieties, coral, amber, and mother-o'-pearl . . . .

Entirely new and never tackled by any museum or studied by any one is the theme of Chinese love of birds and singing and fighting insects; in this domain I have a unique exhibit to offer, as instructive, as beautiful, and consisting of a series of marvelous bird-cages and cricket-boxes with tops or covers carved from ivory and jade, as well as all paraphernalia used in capturing and keeping insects.

In accordance with instructions given by Trustee Mr. Edward E. Ayer, I collected, to a certain extent, ancient pewter objects, amounting in number to 18, chiefly teapots with jade spouts and jade handles, waterpots, winepots and tea-canisters, a sacrificial lamp utilized in ancestral worship, a very curious cast figure of French Rococo style, a large ancient vase, and a symbolic presentation vase with fish . . . . The business in ancient pewter was much handicapped at this time by the constant demands of Japanese collectors and exorbitant prices voluntarily paid by them for this article.

I left China more than ever convinced that she has produced the most marvelous civilization on earth and the finest types of humanity that may be found in any society. Present conditions as brigandage and governmental misrule do not affect my convictions or shake my confidence in the future progress of the country. In China the people are of infinitely vaster importance than the government. The majority of people are good, civil, well-mannered, open-minded, kind-hearted, energetic, intelligent, generous, and hospitable, wonderful in every respect. I did not have a single unpleasant experience or untoward incident. I did not meet any adventures because I did not seek them, but attended to my business in a business like fashion. I received nothing but genuine courtesy and kindness, respectful consideration, and sympathetic understanding of my mission. Without the sincere and hearty cooperation of my Chinese and Eurasian friends its aims would not have been attained . . .

I am most indebted . . . to Mr. Thomas R. Abbott, a Eurasian of American and Chinese extraction, who became a most devoted friend to me, and through whose excellent services it was possible to secure many of the best things in my collection. First of all, he gratuitously placed at my disposal his Chinese house which I made my headquarters, and where I performed all office work, cataloguing, storing and packing of collections. This was of greatest advantage, as in this manner it remained unknown where my acquisitions were located. As a matter of principle and a measure of precaution I have adopted the rule never to show any one anything I collect, while in the field, nor to talk about it. The inquisitive foreign residents of Peking naturally were curious to see what I had, and were told that they could see it only in Chicago. On several occasions suspicious individuals called at my hotel to find out what I was doing and collecting (some people asserted they were government agents or spies, but I cannot vouchsafe for the correctness of this opinion), and I could honestly assure them that I had nothing whatever in my room to show them and that I had just obtained a few minor articles which had already been despatched by parcel post. In fact, no one in Peking, save Mr. Abbott, knows what I got there. Thanks to his familiarity with Chinese customs and folklore and the state in particular, Mr. Abbott was most helpful to me in studying stage plays and

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**Jade, a Study in Chinese Archaeology and Religion,* 370 pp., published in 1912 by Field Museum Press

Mortuary figurine, clay; T'ang Dynasty (A.D. 618-906). Represents a lady-in-waiting. High waistline, Medici collar, and modern décolleté were anticipated hundreds of years before they appeared in Europe. About 100 cm high. Cat. No. 127536. On exhibit in Hall 27, Case 18.

theatrical costumes, which after a prolonged study of the subject resulted in the final selection of fourteen typical actors' dresses complete with all paraphernalia.

Both Peking and Shanghai have organized a commercial museum in which are displayed products and manufactures from all parts of the empire; provided with written labels giving the name of the product, locality and name of the firm, these collections are very instructive, and in many cases gave me a useful hint as to where to apply for certain articles. One afternoon, e.g. I noted in the Commercial Museum of Shanghai a rather attractive display of native tobacco leaves. I noted the name of the firm, a Chinese wholesale house, and called there the same evening. Although the employees, according to their custom, were all congregated around the dinner table, busy with their evening repast, they hurried to take several bales of tobacco-leaves out, opened them, and courteously explained the different qualities and the character of their business. I requested samples of each brand that was for sale, and was asked to come again in a few days when they would be ready with the necessary information to accompany each bundle in writing. When I called again, receiving my specimens and offering payment for them, the manager steadfastly refused to accept any, saying that he was proud of making this small contribution to a museum in America, and requesting only that the name of the firm be placed on the label as that of the donor, as had been done in the Commercial Museum. I was agreeably surprised, not so much at the gift itself as to the fine and unusually progressive spirit of this man who was able to grasp his opportunities. . . . This incident illustrates well that museums have an educational and ethical function and may even contribute toward the promotion of fellowship and good feeling between nations. . . .

At Shanghai I spent the first two weeks on my arrival and the last two weeks before my departure on an intensive study of the private collections of prominent and wealthy Chinese, by whom I was specially invited. Most of these men have a deep-rooted aversion to the foreigner (and they can hardly be reproached for it), surround their treasures with great secrecy, and have never shown them to any foreign residents of China. I must confess that in the houses of those men I saw more of real art in a few weeks than in the States within fifteen years; and, in my estimation, they possess art-treasures out-weighing in value the contents of all European museums combined. The possessions of these men, both in magnitude and artistic quality, almost stagger belief; and their residences, with their refined surroundings, tasteful arrangement of rooms, and artistic furniture, baffle description. Although owners of enormous fortunes or captains of finance and industry, these men are animated by a deep and genuine love of the ancient art of their country, are well versed in their literature, highly cultivated and learned, and distinguished by an almost excessive sense of modesty and finesse coupled with an extreme simplicity and charm of manners. The last mentioned feature deserves particular emphasis, as in intercourse with foreign collectors in China I was always struck by their shocking conceit and cocksure judgment, these will keep on telling you that they have the finest or biggest collection of this or that, that no one else can have a finer piece than this or that, and will not even permit an argument or discussion. Nothing of the kind is ever done by Chinese. The days I was privileged to spend in the company of the Chinese collectors, who are gentlemen in the true sense of the word, over their paintings or bronzes in intelligent conversation and interchange of ideas I count among the most pleasant and fruitful of my pilgrimage and among the happiest of my life. Indeed it was worth while to make this trip merely to see their paintings and hear these men talk about them. . . . I cannot refrain from referring briefly to the wonderful collection of ancient bronzes of Mr. Chen. . . reputed to be the wealthiest man of Shanghai, enjoying the comfortable income of about g$300,000 a month, chiefly derived from rents of houses of which he owns several thousands: thus, he is, so to speak, a collector of rents and antiques. He dwells in a house on Carter Road designed according to his own plans in the unique form of an octagon, eight rooms occupying each of three stories; forty servants assist him. . . . The most extraordinary feature about this singular house. . . is his collection of 400 archaic bronzes comprising only the earliest periods and the efficient manner in which they are displayed in eight of his rooms on the first floor. They are perfectly arranged on glass shelves in most artistic cabinets running along the walls or across the room, which would do credit to the foremost art museum of Europe or America. His collection is easily worth two million dollars and possibly even more, but will never be sold. He knows each and every piece and discussed it intelligently, being a man of very modest, genial and kind-hearted disposition and prepossessing manners . . . I reflected that a country which produces such perfect types of humanity as the result of a many thousand years old civilization and social training can never be lost, and that it is just such types of men who are the true index of the degree of a nation's civilization.

The second subject of study which engaged my attention was the stage, and I soon found out to my satisfaction that since 1910 dramatic art had assumed a novel and most striking development. The stage has become more realistic, painted and changeable backgrounds and colored light effects being utilized with great success. The plots, the manner of acting and singing, as well as the music and costumes have practically remained the same, but the dialogue has grown more lively and human. Many novel plays, even social problem plays, have been added to the old repertoire. Acting and dancing have improved and progressed to a remarkable degree, and I never saw anywhere more graceful and artistic performances of interpretative dancing than by actresses of Peking. It is no exaggeration to say that Chinese women in general are the best dancers in the world. The actors surpass ours in life and motion as well as in power of characterization. Altogether, the theatre is the most attractive and pleasing feature of modernized China, and in view of the rapid transformation of all phases of life remains the only available source for the study of ancient customs and manners, as well as costume and general conditions. It has been aptly said that "in no country in the world can more be done through friendship and for friendship's sake than in China." On the day of my parting from Shanghai twelve Chinese gentlemen gathered on board the President McKinley to say good-bye, during the preceding days they had sent parting gifts like tea, preserved fruits, or silk. For a quarter of an hour we were seated around a table in the smoking-room, talking till the last moment about art and the latest archaeological discoveries in Honan. For a half hour this little group remained standing on the wharf, waving hands, hats, or handkerchiefs until they lost sight of the departing steamer. I felt that the sympathy of these men which I carried along with me was the best reward for any exertions and efforts I had made.

Yours very respectfully,
Berthold Laufer

Ink cakes of various colors. Ch'ing Dynasty. Cat. Nos. 126644, 126645, 126646.

126646
126644

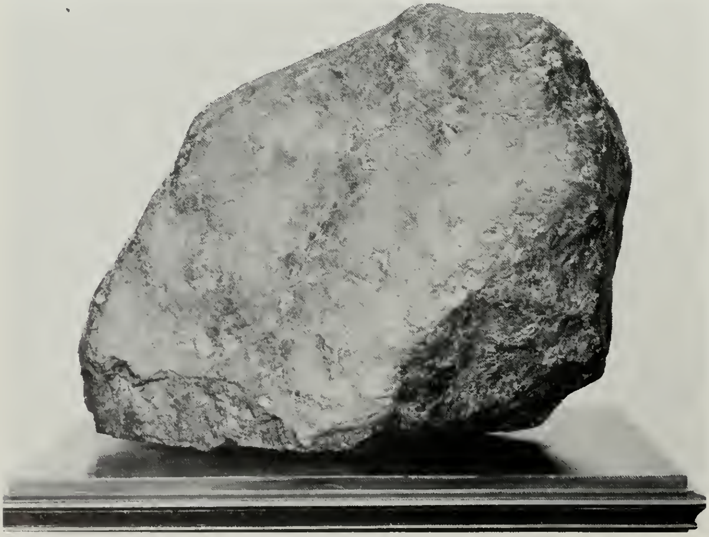
46 Years Ago...

Field Museum in 1930: Meteorites, Lizards, and Turtles

The *Field Museum of Natural History Bulletin* has, with this issue, reached the venerable age of 46. First issued in January, 1930, the publication was then known as *Field Museum News* and consisted of four pages. It was aptly named, for the magazine specialized in news about staff members and about acquisitions, expeditions, lectures, and other in-house activities. From time to time, items of special interest which appeared in early issues of the magazine will be reproduced here. The brief articles below were selected from Vol. 1 (1930).

July: **New Meteorite Acquired.** Field Museum is now the possessor of the largest single meteoric stone ever seen to fall.* This messenger from space arrived on the earth February 17, 1930, at 4:05 a.m. It fell at Paragould, Arkansas, on a farm owned by Joe H. Fletcher. The stone as received at the Museum weighs 745 pounds, being 100 pounds heavier than any previously recorded meteorite which was seen to fall. The original claim of the finder was 820 pounds, but part was lost to souvenir hunters and through other causes. In falling it penetrated hard clay to a depth of nine feet. The largest stone previously known which was seen to fall from a meteor weighs 646 pounds. This fell at Knyahinya, Hungary, June 9, 1866, at 5 p.m. It penetrated the earth to a depth of eleven feet. It is now in the Vienna Museum. The meteor which brought the stone now in Field Museum attracted attention in three states, Missouri, Illinois, and Arkansas. Its light was so bright that persons in St. Louis who saw it thought it was an airplane going down in flames. It burst with detonations which were heard as far north as Poplar Bluff, Missouri, and as far east as Covington, Tennessee. The meteor came from the southwest. At Paragould nearly every one in the town was awakened by the detonations, and live stock was stampeded....

The meteorite was purchased and presented to the Museum by President Stanley Field. [The meteorite is in Hall 35 but is currently not on view, due to building renovation activities.]



◄ *Field Museum's own "pet rock"—the Paragould meteorite, at one time the world's largest known stone meteorite ever seen to fall. (In Hall 35 but temporarily closed off because of construction work.)*

September: **Rare Lizard Is Stowaway.** Arriving unheralded from south Texas, after making the trip north as a stowaway in a crate of lettuce, an extremely rare plated lizard has been received at Field Museum. The lizard, the scientific name of which is *Gerrhonotus infernalis*, is one of the only two species in its genus which had been previously missing from the Museum's collections, according to Karl P. Schmidt, Assistant Curator of Reptiles and Amphibians. It was presented to the Museum by James J. Mooney of Deerfield, Illinois, who obtained it from a grocer into whose store it emerged from the crate of lettuce.

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*The Paragould meteorite was displaced as the "largest single meteoric stone ever seen to fall" on Feb. 18, 1948, when a much larger meteorite of the same type fell in Norton County, Kansas. This meteorite, now at the University of New Mexico, Albuquerque, is two or three times heavier than the Paragould stone.

October: **A Modern Horse's Attitude Toward the Mesohippus.** An amusing incident of a modern horse's reaction upon encountering a restoration of one of his tiny three-toed predecessors of some thirty million years ago is told by Frederick Blaschke, the sculptor who created the Mesohippus group recently installed in Ernest R. Graham Hall of the Museum.

Mr. Blaschke has a studio on a farm-like estate near Cold Spring-on-Hudson, N Y. After completing one of the small prehistoric horse figures (about the size of an average collie dog in accordance with Mesohippus fossil skeletons) he placed it upon a grassy patch to test out its appearance against a rural background

An old farm horse belonging to Mr. Blaschke eyed his master's work suspiciously. In the past this animal had completely ignored other domestic animals, and also the deer and other wild animals which occasionally come up to the edge of the estate. But, says Mr. Blaschke, the representation of his remote relative excited unusual interest on the horse's part, and he approached cautiously to inspect it closer. When Mr. Blaschke pretended to pet the model the live horse snorted with jealousy. Finally he ran up close as though bent on destroying this alienator of his master's affections, but stopped suddenly and then ran away as if in fear. There seemed to be no doubt, says Mr. Blaschke, that the horse recognized Mesohippus as a member of his own family.

The Bronze Disease. Many of the ancient bronzes received at Field Museum and at other museums are infected with the bronze disease or malignant patina. If not cured this disease utterly destroys the bronze. Its cure has always been difficult, but is now under control at Field Museum.

It appears first in mild cases as a rough patch of a whitish green color which, if neglected, may spread over the entire surface, constantly penetrating deeper, and in the end completely destroying the bronze. The disease is unique and has nothing in common with the bacterial decay of wood and fabric, nor is it related to the tin disease which sometimes destroys pewter. It is caused by the presence of corrosive compounds of copper and acid which have the property of renewing themselves after their activity has been expended in corroding the bronze. A minute speck of malignant patina can, theoretically at least, destroy the largest bronze.

There are a number of copper compounds which can act in this way, but the only one found active in Field Museum is the basic chloride of copper. Bronzes become infected with this chloride when they are long buried in soil which contains salt. This salt may come from organic waste or it may be desert or sea salt.

The disease is cured in Field Museum by an electric treatment originally devised for another purpose, and by a chemical treatment developed in the Museum Laboratory.

December: **Turtle Colony Established.** More than 600 painted box turtles of a species native to the southwest mysteriously appeared last month on a vacant lot at Seventeenth Street and Wabash Avenue. They were collected by the Humane Society and turned over to Field Museum for care. Karl P. Schmidt, Assistant Curator of Reptiles and Amphibians, after making certain scientific observations, took the turtles to a dune region north of Waukegan, and there turned them loose. It is expected that they will colonize, and the results of the experiment are to be followed up by further observations. Twenty-five were preserved and retained in the Museum collections.

Mesohippus reconstruction by Frederick Blaschke, one of several in a group on view in Hall 38 (Ernest R. Graham Hall). ➤

Focus: People in the Mainstream

Illustrated Lecture Series, Spring 1976

An illustrated lecture series looking at what people who are actively involved with environmental problems and concerns are doing, how they feel about it, and how this relates to the quality of life for all of us.

Mar. 5, 6 **Man First? Man Last? The Meaning of Natural Diversity to Human Evolution**
Speaker: Hugh H. Iltis, Professor of Botany, University of Wisconsin.

People love nature; we fill our houses with plants, pictures and pets. Nature represents peace and escape from the technical world. But the need for nature in our lives is more than an indulgence or a frivolity—it is necessary to our healthy emotional development; it is rooted in our earliest evolution.

Mar. 12, 13 **Landscape: Some Visual Dimensions of Environment**
Speaker: Charles Davis, Author, Photographer.

Landscape has both environmental and cultural aspects. We are moved to different emotions by different landscape scenes, and our appreciation transforms these feelings into art. What is the interchange between these two dimensions of man in the landscape?

Mar. 19, 20 **The Sun Gave Man the Power**
Speakers: Bob and Joan Root Ericksen, Film Producers, Directors of the Sun Foundation for Advancement in the Environmental Sciences and Arts

Two hundred years ago, the Pikunni-Blackfeet people of the northern Great Plains lived from this land, as their ancestors lived before them. How does our adaptation to the environment compare with theirs? A look at our culture through an oral history of this Native American tribe.

Mar. 26, 27 **The Flickering Flame**
Speaker: Harlan Draeger, environment-energy reporter, Chicago Daily News

The ups and downs of the environmental movement, seen from the vantage point of an experienced reporter. A discussion of illusion, reality and what lies ahead.

Apr. 2,3 **The Sky Wolf**
Speakers: Cheryl and Neil Rettig, Film Producers, Explorers

Four young Chicago explorers, including one woman, succeeded after three years of research to document the secretive nesting habits of the world's largest and most formidable eagle—the harpy. The films they made are the first ever to reveal this rare subject.

Apr. 9, 10 **Waste Not, Want Not: Sewage Recycling and Chicago's Deep Tunnel Project**
Speaker: Joanne H. Alter, Commissioner, Metropolitan Sanitary District

When does a waste become a resource? Commissioner Alter will speak about the major recycling projects of the Metropolitan Sanitary District, including the billion-dollar Tunnel and Reservoir Plan and how it will affect all of us in the area.

Apr. 16, 17 **Building, People, and the Urban Environment**
Speaker: Carl W. Condit, Professor of History, Art History and Urban Affairs, Northwestern University

What is the ecology of the urban environment? What is the relationship between the human inhabitants and the technology of the city?

Apr. 23, 24 **The Zoo and the Modern World**
Speaker: George Rabb, Director, Chicago Zoological Park

How is the zoo responding to our need for environmental education? Using his studies of wolves as a prime example, Dr. Rabb will explain new developments in exhibit techniques that allow for more natural behavior of animals in zoos.

Apr. 30, May 1 **Topic to be announced**
Speaker: Dave Bielenberg, Metropolitan Sanitary District

All programs will be given in the ground floor lecture hall on Fridays at 7:30 p.m. and repeated on Saturdays at 2:30 p.m. All programs will be free. Total attendance for each day's program limited to 180 adults. Previous programs have been presented in the larger James Simpson Theater. That area is currently being renovated in order to provide barrier-free access to the building for the handicapped.

Food service will be available in the Museum cafeteria until 7:30 p.m. on Friday evenings during this series.

This lecture series was partially funded by a gift from Mr. and Mrs. Ray A. Kroc and grants from National Endowment for the Humanities, Field Foundation of Illinois, and the Charles E. Merrill Trust.

Winter Windup

Wednesday Evening Slide Lectures for Members

Field Museum is pleased to present a series of four Wednesday evening slide lectures in the separate disciplines of zoology, anthropology, botany, and geology. In the quiet comfort of the Museum's Presidents' Room, Members will have an opportunity to dine and meet informally with curators and to vicariously share in the thrills of their explorations. The tickets are $7.50 per person for each of the four evenings. Make your reservations now for:

Temples in Jungles: The Rise and Survival of Civilization in Southeast Asia. Bennet Bronson, assistant curator, Asiatic archaeology and ethnology, will show us some of the splendors of ancient civilizations in Thailand, Ceylon, Cambodia, and Indonesia.

Monsters in Miniature—A Natural History of Deepsea Fishes. Robert K. Johnson, associate curator of fishes, will discuss aspects of the biology of these creatures. Deepsea fishes are among the most bizarre members of the animal world, yet those very aspects of their structure and behavior that seem so strange represent remarkable examples of adaptation to an extreme environment. Dr. Johnson's program will center around ecological features of the open-ocean habitat, with discussion of adaptations that allow fishes to flourish in the depths.

The Forest Beyond the Tourists' Trail. One of the more peculiar types of tropical vegetation, the elfin forest, will be discussed by Lorin Nevling, Chairman of the Department of Botany. Particular emphasis will be placed on a Puerto Rican forest that has been the subject of a multidisciplinary research effort. The program will examine research techniques, structure of the forest, and will discuss alternate theories of origin.

Frenzied Fossils is the topic chosen by Eugene Richardson, curator of fossil invertebrates; the lecture will be augmented with a color movie. Great numbers of sharks swam into the bayous and channels when a shallow sea flooded across a coal swamp 300,000,000 years ago. A few months later the water level dropped during a dry season and the sharks found themselves trapped in shrinking ponds. What did they do when they became disastrously overcrowded? What would you do? A Field Museum shark quarry uncovered not only specimens but also a detailed record of their remarkable behavior.

The above programs are scheduled for 6:30 p.m. for these Wednesday evenings: March 3,* 10, 24, and 31. Reservation will be accepted on a first come, first served basis. Applications should be accompanied by full payment of $7.50 per person, covering dinner and program. Children twelve years of age and older are invited; guests of members are also welcome.

*A fish entree, as well as meat, will be served on Ash Wednesday.

CLIP COUPON AND RETURN TODAY!

Field Museum's Wednesday evening slide lectures

March 3 Program:
"Temples in Jungles"
No. of persons attending ____________

March 10 Program:
"Monsters in Miniature"
No. of persons attending ____________

March 24 Program:
"The Forest Beyond the Tourists' Trail"
No. of persons attending ____________

March 31 Program
"Frenzied Fossils"
No. of persons attending ____________

____
Member's Name

____
Street

____
City State Zip

____
Phone (daytime) (evening)

Amount enclosed: $ ____________

All reservations will be confirmed.

For further information call Dorothy Roder, Field Museum, 922-9410, ext. 206 or 219.

field briefs

Where Is Mr. Bushman?

At the north end of Stanley Field Hall is located one of the most frequently used, yet seldom heralded, visitor services the information booth. According to Glenn Petersen, senior sergeant, Security and Visitor Services, 12,679 questions were fielded by the information booth during July, August, and September of 1975 and, on the basis of his records, the mummies (879 questions), Bushman, the gorilla (575), dinosaurs, (569), and cavemen (314) still rank as the most popular attractions among the permanent exhibits Directions to these exhibits are handled with dispatch, but Sgt. Petersen's assistants must also be prepared to respond with tact, patience, and a ready sense of humor to the totally unexpected, including the following questions that were asked during that three-month period

"Weren't the elephants facing the entrance?"
"How much more space would they need to put all the stuff in storage on exhibit?" [Conservatively, Chicago's Merchandise Mart, the Pentagon, and Sears Tower would begin to provide exhibition space for the Museum's more than 13 million specimens.]
"Can I sit down?"
"How do they preserve artifacts in cases here?"
"Have you seen many celebrities?"
"Where can I buy a voodoo doll?"
"Can you tell me where Mr. Bushman is?"
"Is this museum all around here?"
"Did my wife come back yet?"
"Isn't there an elephant missing?"
"Do you think you could hit the ceiling with a baseball?"
"Will I be hurt by throwing a penny into the fountain?"
"Where's the little palace you have here?"
"Is the painting of a male nude here?"
"Is this what you do all day?"
"What percent of your body is water?"
"If I take a flash picture, will it come out okay?"
"Where is Bushmeal?"
"How can I get my kid's balloon off the ceiling?"
"Where are the carmine bee eater and the lilac breasted roller?"
"Do you know where my mother is?"
"How can I see this place real fast? I have to see all four museums today."
"Did you see a balding, rather large man around here?"
"Have you seen a shoe like this?"
"How do you change light bulbs?"
"Where is a place you can dig up bones?"
"How do you say 'fourteen' in Spanish?"
"Was this building ever a church?"
"About that planetarium—is that all plants?"
"Can I camp on the lawn?"
"Where is Roy Rogers' horse?"
"How did the fossils get into the floor?"
"Do you have large fish outside?"
"What are you?"
"Where and how were the specimens collected?"
"Is this all natural history?"
"What's in here?"
"Where's the flea market?"
"Have a couple of couples come here asking whether another couple was here yet?"

The answers to these questions, alas, were not recorded

◄ *Bushmeal, Mr. Bushman, or just plain Bushman? He's even been called Sinbad and Gargantua. Bushman is to be found in Hall 1 (Anniversary Exhibit).*

Staff News

John Kethley, who joined the Field Museum staff five years ago, has been promoted to associate curator of insects. Since coming to the Museum he has significantly enlarged the Museum's collections of mites, ticks, and chiggers, which are important ecologically and medically and constitute Kethley's principal area of research. Though his work is concerned mainly with the classification and evolution of this large group of small animals, he is particularly interested in the population ecology of mites and chiggers that reside in the quills of birds and ride around under the scales of lizards and on the bodies of millipeds. Kethley has been head of the Division of Insects since November, 1974.

Ms Gretchen Eichholtz has joined the staff of the library as reference and circulation librarian. Ms. Eichholtz received her M.S. in library science from Drexel University and also holds an M.A. in anthropology from the University of Iowa.

William J. Lauf has joined the Museum as controller, a new position. Mr. Lauf is a native Chicagoan and was graduated from DePaul University (B.S.C. and M.B.A.). He was most recently with TSC Industries as vice president/finance.

Lawrence Klein has been appointed chairman of the Department of Exhibition. He has lived in Chicago most of his life and comes to the Museum from the field of commercial design. He attended the University of Louisville, the American Academy of Art, and the Art Institute of Chicago. Until a year ago he was president of Larry Klein and Associates, Inc., which was mainly concerned with planning and design of sales and exhibition pavilions and of retail stores and with graphic identity and signage systems for new communities.

Membership Increase

Membership in Field Museum rose by 1,335 during 1975 to an all-time high of 23,145—a 6.1% increase for the year. According to Dorothy Roder, membership secretary, it was the largest annual jump in membership since 1971. Five years ago the membership stood at 19,342, and a decade ago at 9,581—less than one-half the current figure.

Kennicott Club Meets

Robin B Foster, assistant professor of biology at the University of Chicago, will speak on tree falls and the dynamics of the tropical rain forest at the February 3 meeting of the Kennicott Club, convening at 7:30 p.m. at Field Museum. Nonmembers are welcome to the meetings, which regularly occur on the first Tuesday of each month.

FEBRUARY at Field Museum

SPECIAL EXHIBITS

BICENTENNIAL EXHIBIT

"MAN IN HIS ENVIRONMENT," a major new permanent exhibit in a major new exhibition hall. This dramatic, 8,000-square-foot exhibition (two film theatres plus four areas of three-dimensional displays) explores nature's magnificent system of checks and balances and man's dependence on this sytem. The exhibit also deals with man's activities and his effect on the quality of life on our planet, and asks visitors to consider the implications for our earth's future.

The exhibit is part of a comprehensive program involving a traveling *Man in His Environment* exhibit and a series of related museum programs to run well into 1977. (See *Environment: The Sum of its Parts* below.)

ESKIMO ART EXHIBIT

"19TH CENTURY ALASKAN ESKIMO ART" exhibit, in Hall 27. In the language of the Eskimo there is no word for "art." Yet art was inseparable from Eskimo life, especially among the peoples of the Bering Sea area in the late 19th and early 20th centuries, and the most commonplace articles were beautifully fashioned and decorated

Most of the examples of northwest Alaskan Eskimo art, featured in this exhibit, were acquired by the Field Museum in the 1890s during the first decade of its existence. They include tools, weapons, household utensils, religious and ceremonial artifacts, and they exemplify the skill of the traditional Eskimo who used available tools and limited raw materials (caribou antler, driftwood, walrus-tusk ivory, and baleen) to depict the world around him.

Self-guiding Eskimo art exhibit tour sheets, for children, are available at the information booth. All children who can read and write are invited to participate. Bring pen or pencil.

CONTINUING PROGRAMS

ENVIRONMENT FILM SERIES

"ENVIRONMENT: THE SUM OF ITS PARTS," offered in conjunction with the *Man in His Environment* exhibit. The February theme, "Human Alternatives," deals with key environmental problems that we now must face. Films are shown at 11:00 a.m. and 1:00 p.m. in the Meeting Room, second floor north. Series continues through spring 1976.

Feb. 6, 7, 8.	*Pollution—A Matter of Choice* (53 min.)
Feb. 13, 14, 15:	*Multiply and Subdue the Earth* (67 min.)
Feb. 20, 21, 22.	*The Great Sea Farm* (25 min.) *Should Oceans Meet?* (30 min.)
Feb 27, 28, 29.	*But Is This Progress?* (51 min.)

ESKIMO FILM PROGRAM

CONTEMPORARY CANADIAN ESKIMO ART AND ARTISTS are illustrated in three films which can be seen daily at 12.00 noon. For location, inquire at entrances.

Eskimo in Life and Legend (23 min.) The story of a great hunter who carved the image of his wish from a chosen piece of stone—and saw the wish come true.

Eskimo Artist Kenojuak (19 min.) Kenojuak, artist, wife, and mother, makes her drawings when she is free of the duties of trail or camp. Her thoughts are spoken as commentary for the film and add to our understanding of the images she creates.

Kalvak (20 min.) As a child, Kalvak, now a sixty-eight-year-old Eskimo woman, travelled on many long hunting trips with her parents. She uses the subjects of these experiences which give her beautiful, sensitive drawings a strong environmental emphasis.

SATURDAY DISCOVERY PROGRAM

PROGRAMS RECENTLY ADDED to the continuous stream of tours, demonstrations, and participatory activities offered every Saturday, from 11:00 a.m. to 3:00 p.m., as part of the museum's Discovery Program. They are: *Eskimo Art and Culture*—A film and tour that explores the relationships between traditional Eskimo art and culture, and examines the ways in which Eskimos adapted to changes in the modern world *Tibet*—Learn about magic and mystery in the culture of Tibet *Traditions in Chinese Art*—A half-hour tour traces the origins and development of Chinese art styles.

Other Discovery Programs include the popular clay dinosaur modeling in the Hall of Dinosaurs (take your model home), and the half-hour tour through the Egyptian collection—which also explains the "how's" and "why's" of mummy-making.

For specific programs and locations, inquire at entrances.

WINTER JOURNEY FOR CHILDREN

"NOMADS OF THE MYSTIC MOUNTAINS," a free self-guided tour through the museum's colorful Tibet exhibit. All children who can read and write are invited to participate. Journey sheets in English and Spanish are available at the information booth. Bring pen or pencil.

WEAVING DEMONSTRATIONS

THE ANCIENT ART OF WEAVING on a two-harness, handcrafted Mexican floor loom, demonstrated by members of the North Shore Weavers' Guild every Monday, Wednesday, and Friday, 10:30-11:30 a.m. and 12:00-1:00 p.m. On Mondays, Feb. 2 and 16, the demonstrations include spinning South Lounge, second floor.

COMING IN MARCH

"MAN IN HIS ENVIRONMENT"
ILLUSTRATED LECTURE SERIES

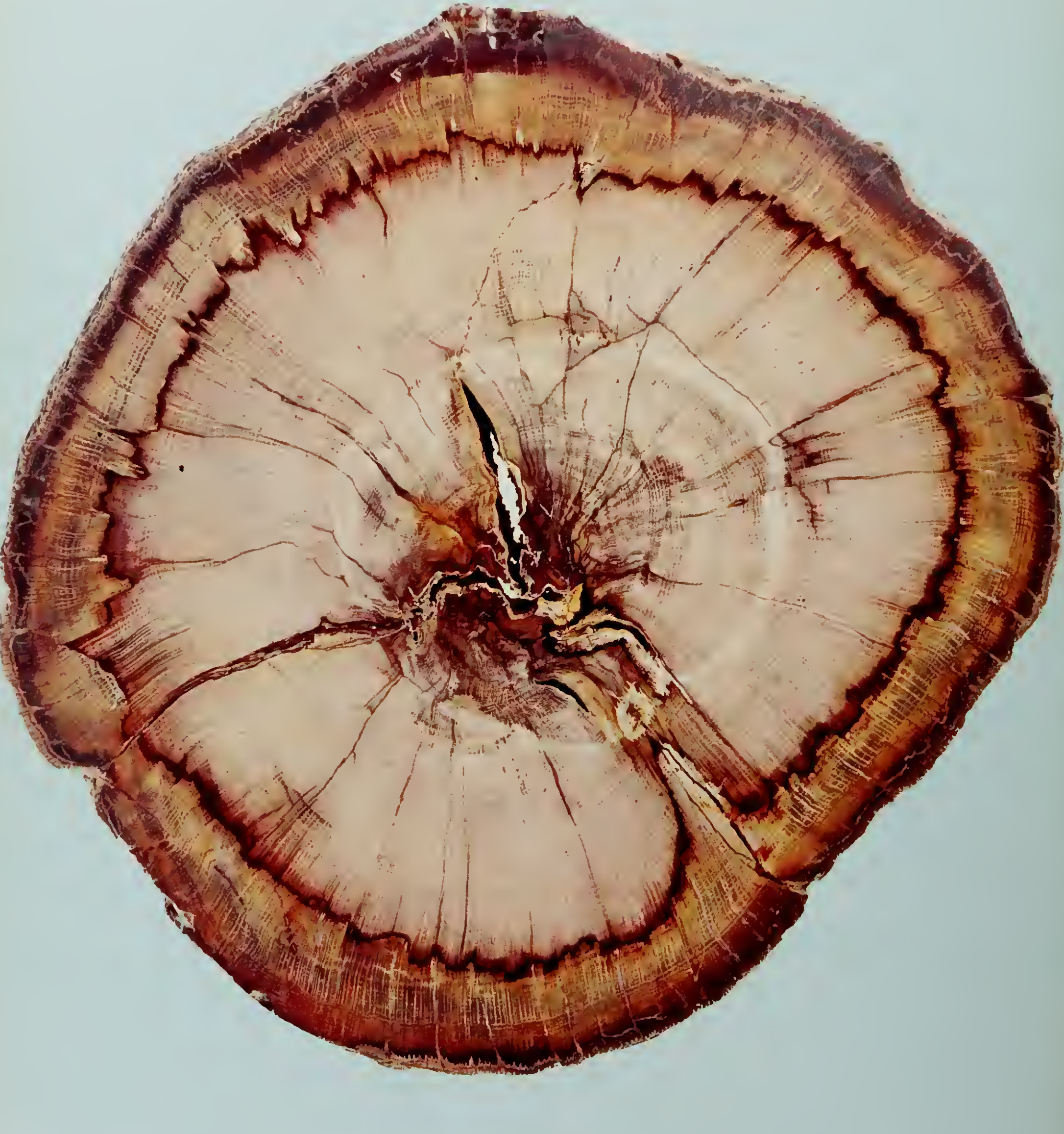
"FOCUS: PEOPLE IN THE MAINSTREAM," begins March 5. These lectures, presented by people who are actively concerned and involved in some aspect of the environment, are designed to reactivate public awareness of environmental issues. Fridays at 7.30 p.m.; repeated on Saturdays at 2:30 p.m. Ground floor lecture hall.

FEBRUARY HOURS

THE MUSEUM opens daily at 9:00 a.m. and closes at 4.00 p.m. weekdays and 5.00 p.m. weekends. On Friday, year-round, the museum is open to 9.00 p.m. Food service areas are open weekdays 11.00 a m. to 3.00 p.m., weekends to 4.00 p.m.

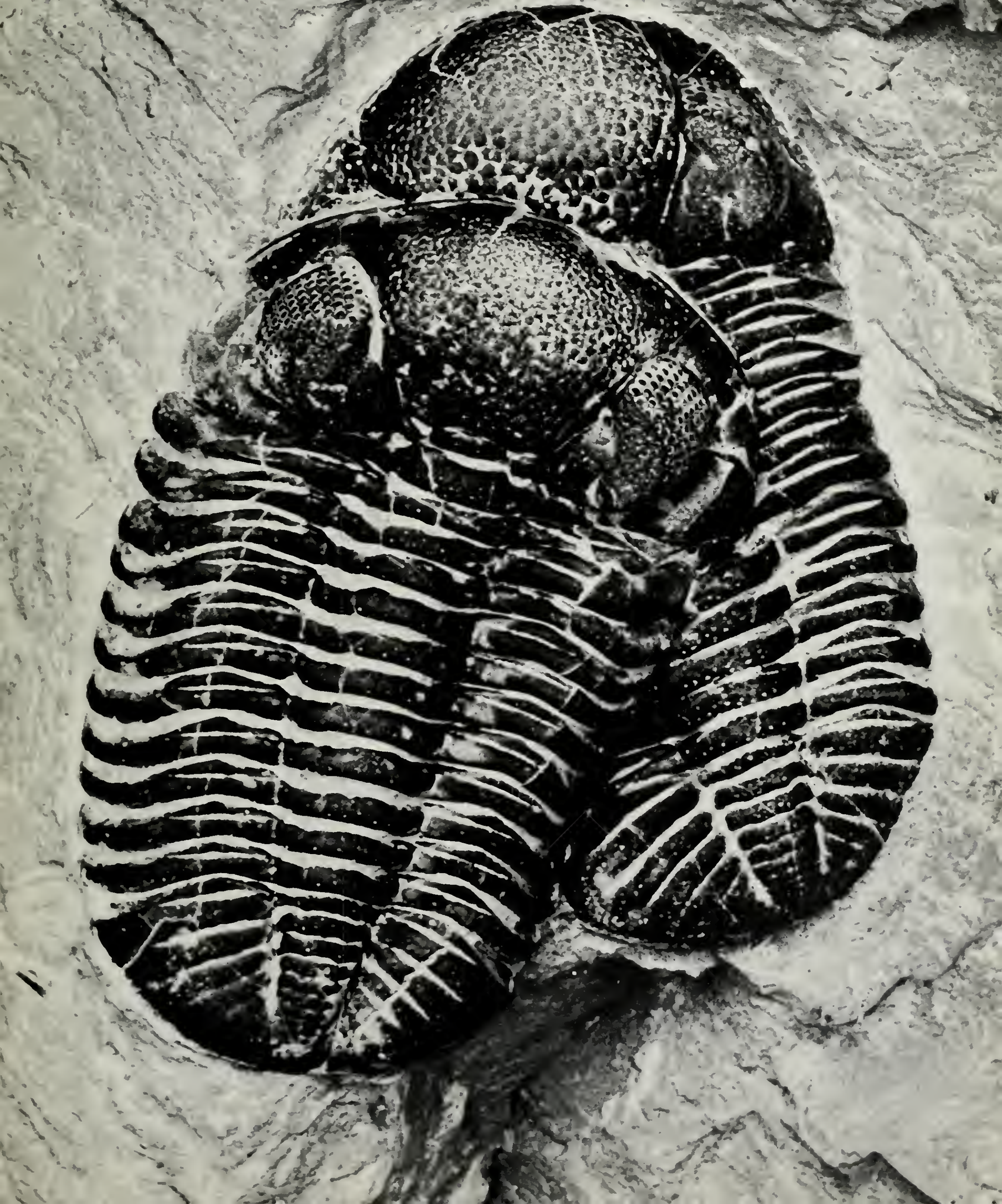
THE MUSEUM LIBRARY is open 9.00 a.m. to 4.00 p.m. Monday through Friday Please obtain pass at reception desk, first floor north

MUSEUM TELEPHONE: 922-9410



March
1976

Field Museum of Natural History Bulletin



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CONTENTS

3 BLACKBALL MINE: HAVEN FOR BATS
By Thomas Lera

6 TRILOBITES: CREATURES FROM THE ANCIENT SEAS
A Picture Essay

13 ENVIRONMENT: THE SUM OF ITS PARTS
Environmental Film Programs, April through August

14 VOLUNTEERS HONORED

16 FIELD BRIEFS

17 LETTERS

18 MARCH AT FIELD MUSEUM
Calendar of Coming Events

FRONT AND BACK COVERS

A pair of trilobites, *Phacops rana milleri* Stewart, from Silica shale of Middle Devonian age (370 million years old) found at Sylvania, Ohio. Both photos by Riccardo Levi-Setti. Enlarged about X6.7. Of all North American trilobites, *Phacops* occurring in silica shale are probably the most spectacular, because of their unusual preservation. The front cover photo was obtained by conventional black-and-white photography; that shown on the back cover was obtained from a color slide. The employment of a variety of techniques in photographing such specimens is often useful in bringing out different aspects of the same structure. The pictorial essay on trilobites, pages 6-12, includes photos done by several techniques. All were made on 35 mm film.

PHOTO CREDITS

Page 3, 4 (bottom): Leonard Rue/Tom Stack & Associates; 4 (top), 5 (top): The Custom Photography Co.; 5 (bottom): Tom Lera; 6, 7: E.N.K. Clarkson; 8 (top): R. Levi-Setti; 8 (bottom): J. Cisne; 9, 10, 11, 12: R. Levi-Setti; 14-17: Museum staff photos.

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As darkness falls, bats swarm from cave to forage for food.

Blackball Mine: Haven for Bats

By Thomas Lera

About eighty miles southwest of Chicago, in La Salle County, Illinois, is Blackball Mine, the site of a large limestone industry that flourished during the early 1900s, but now abandoned. Today, however, the mine's extensive network of passages continues to be of special interest to environmentalists and biologists concerned with cave-dwelling animals such as bats.

Blackball Mine is separated into two sections by Pecumsaugan Creek, a perennial stream. The section to the north and west of the creek is on two levels, one level is about six meters* below the other. The other section, to the south and east of the creek, is on one level. At least thirty entrances lead into the mine; the interior passageways range from about one and a half to four and a half meters high and about four and a half to twelve meters wide.

Three major environmental subdivisions are to be found in the mine: a twilight zone, an intermediate zone, and a deep interior zone. Aside from the

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*About 20 feet

Thomas Lera is a water resources planner with the U.S. Environmental Protection Agency.

naturally illuminated twilight zone, total darkness prevails throughout. The distance of light penetration from any entrance naturally varies according to the size, shape, and orientation of the particular entrance. Temperature and humidity in the twilight zone are about the same as outside the mine. The dark intermediate zone has fluctuating temperature and humidity—variables caused by air currents. The temperature and relative humidity of the totally dark interior zone is constant.

As expected, the greatest number of animal species are to be found in the twilight zone, with the number decreasing as light diminishes. Many species leave the outside when conditions are unfavorable to seek refuge in the cool, moist entrances. Some species venture deeper into the mine but periodically must return outside for food. These species, known as *trogloxenes*, cannot complete their life cycle underground. Bats, moths, crickets, raccoons, and wood rats are examples of this group. Other species known as *troglophiles*,

◄*The endangered Indiana bat* (Myotis sodalis)

Underside of little brown bat (Myotis lucifugus)▼

penetrate beyong the twilight zone and become permanent residents of the mine's deeper recesses. These animals can complete their entire life cycle in the mine.

Blackball Mine is well known for its wintering colony of bats (family Vespertilionidae). The little brown bat (*Myotis lucifugus*) and the eastern pipistrelle (*Pipistrellus subflavus*) are most often seen in the mine, but the Indiana bat (*Myotis sodalis*), which is on the federal endangered species list, also hibernates there. Blackball Mine is, in fact, the only site in Illinois where the latter species is currently known to roost.

During the summer, the bats use the mine as a daytime retreat and at night they emerge to feed on airborne insects of the surrounding country. The unique ability of bats to navigate by means of echolocation in total darkness makes it possible for them to find their way through the mine passages and, once outside, to capture night-flying insects. All bats found in Blackball Mine are insectivorous; on each nightly foray the typical bat consumes two to four grams of insects.

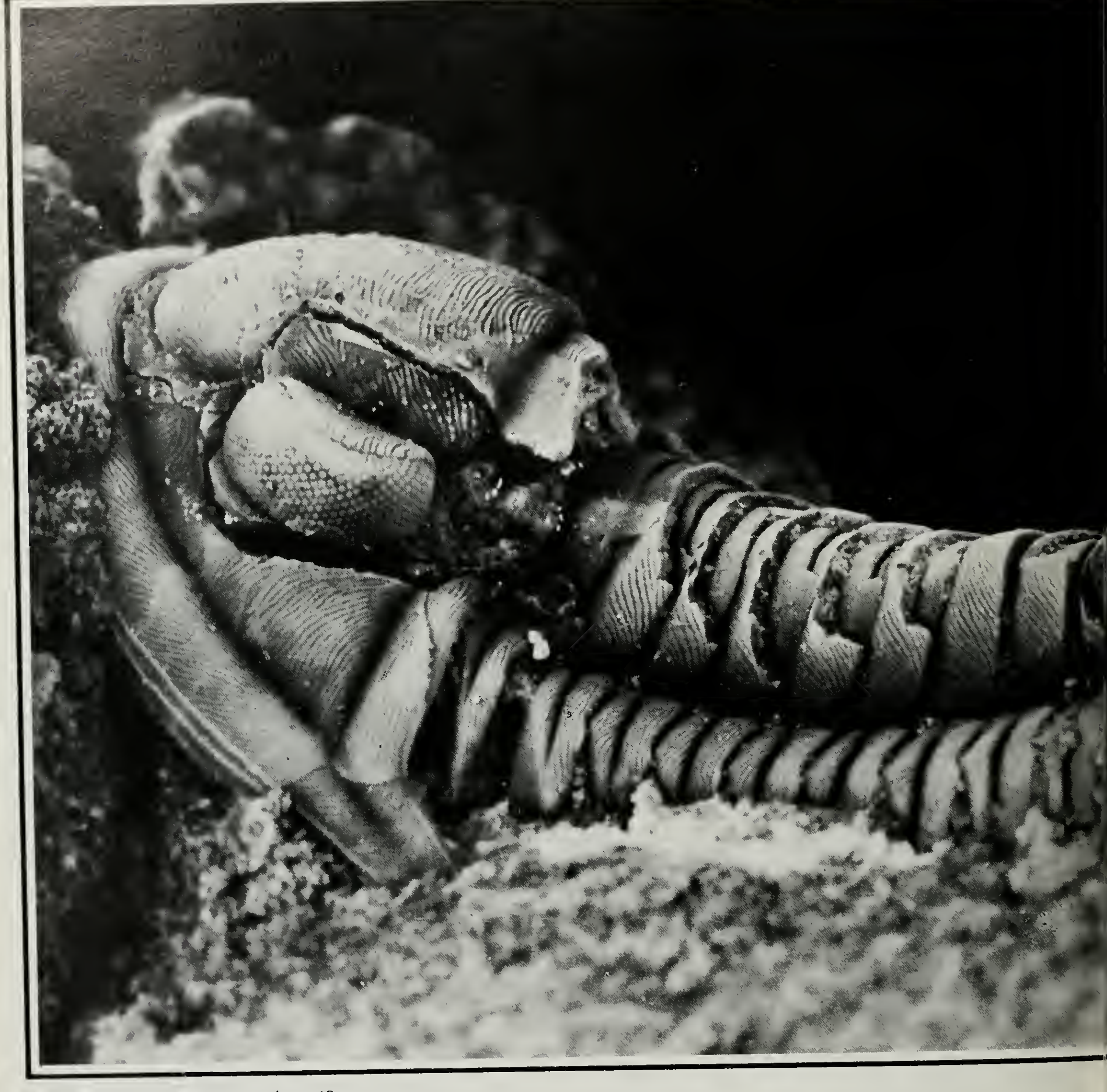
Over the past decade scientists have found that the number of bats in general has been steadily declining. Reasons for this reduction include the loss of habitats and roosts due to quarrying and urbanization, and increase in commercially operated caves, vandalism, flooding, burning of debris in cave entrances, and repeated incursions by uninformed visitors. If hibernating bats are frequently disturbed, they will rapidly use up their stored fat supplies and starve to death before spring.

Occasionally bats are found to be rabid, but this happens so seldom that the United States Public Health Service does not consider the animals to be a public health hazard. They are unique among mammals in being able to survive

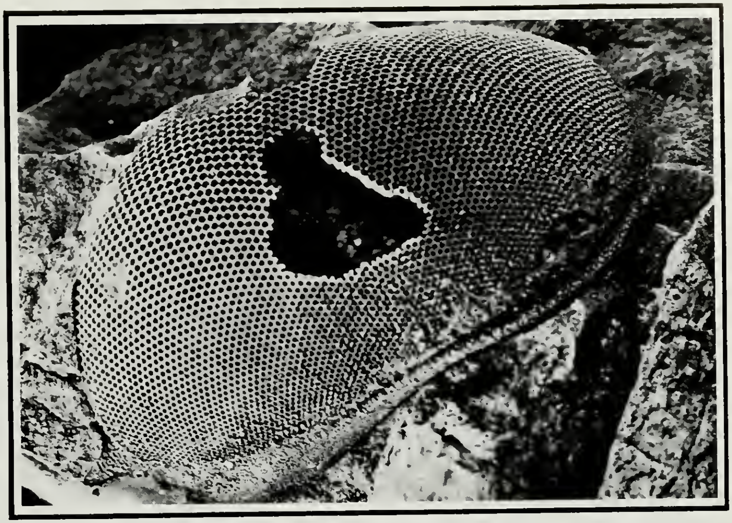
(*Continued on p. 16*)

John S. Hall, now teaching at Albright College, Reading, Pa., was the first biologist to make a comprehensive study of Blackball Mine fauna. Here he removes roosting bats for banding. They are returned to their roosting spot before becoming completely aroused. ➤

➤ *Entrances to Blackball Mine*



Side view of Cornoproetus sculptus (*Barrande*) of Devonian age from Czechoslovakia. Negative by E.N.K. Clarkson. Photographic print by R. Levi-Setti. Enlarged about X26. The fasciculated surface is characteristic of the species.



▲*Side view of eye of* Pricyclopyge binodosa *(Salter), of Ordovician age from Bohemia. Negative by E.N.K. Clarkson. Photographic print by R. Levi-Setti. Enlarged X10. In this remarkable view can be seen the gross structure of the compound eye with its framework of hexagonal facets.*

Trilobites

Creatures from the Ancient Seas

From "Trilobites: A Photographic Atlas," by Riccardo Levi-Setti

There is a perennial fascination in the study of trilobites for professional scholars and amateur natural historians alike. The unique form and vast antiquity of these ancient fossils compel our immediate attention. Trilobites lived in the Palaeozoic oceans for some 350 million years of geological time. During their immensely long history they evolved into diverse forms and colonized numerous environments. They became extinct at the end of Permian time, over 200 million years ago. A great deal is now known about trilobites. They have long been valued by geologists as stratigraphic indicators, and their basic anatomy, their growth and development from the larval stages, the nature of their appendages, cuticular structure, and sense organs, their evolutionary differentiation, and their distribution in time and space have all been the subject of intensive research. But the virtual absence of preserved soft parts imposes strict limitations upon what can be known, and certain important matters may remain forever cryptic, and even the fundamentals of classification are still disputed.

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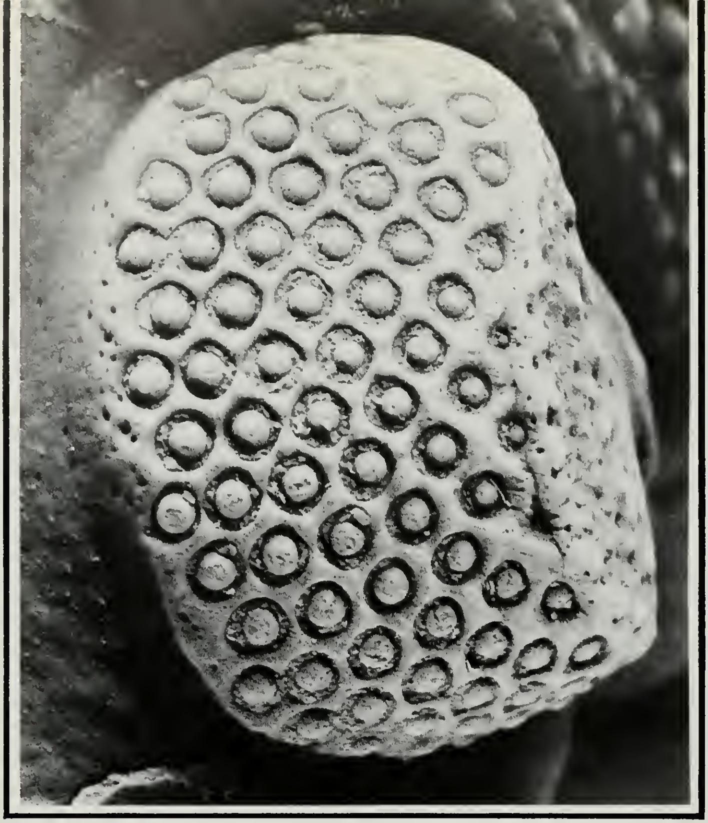
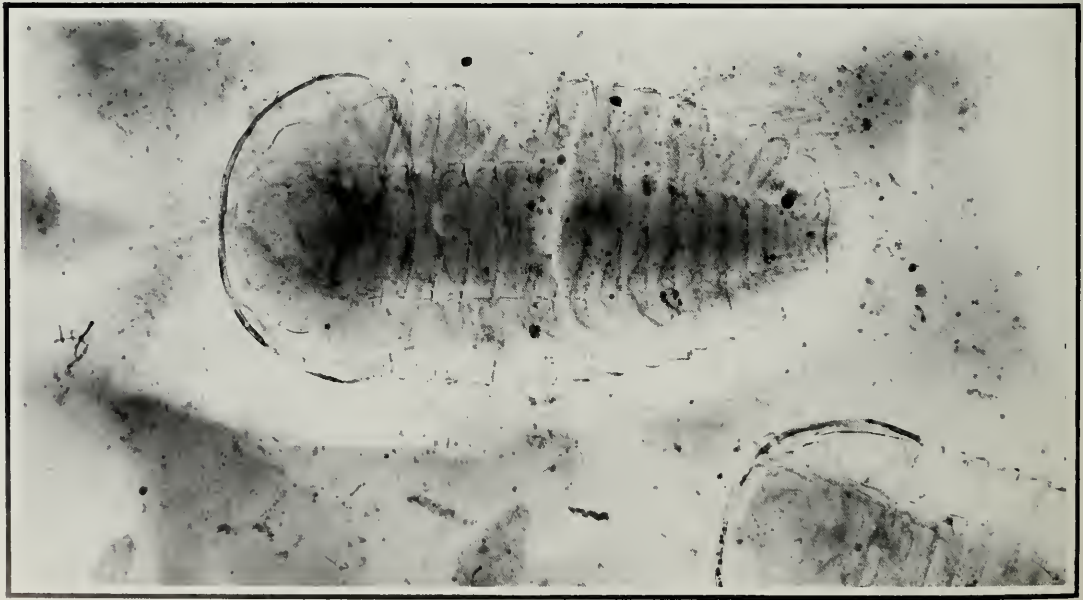
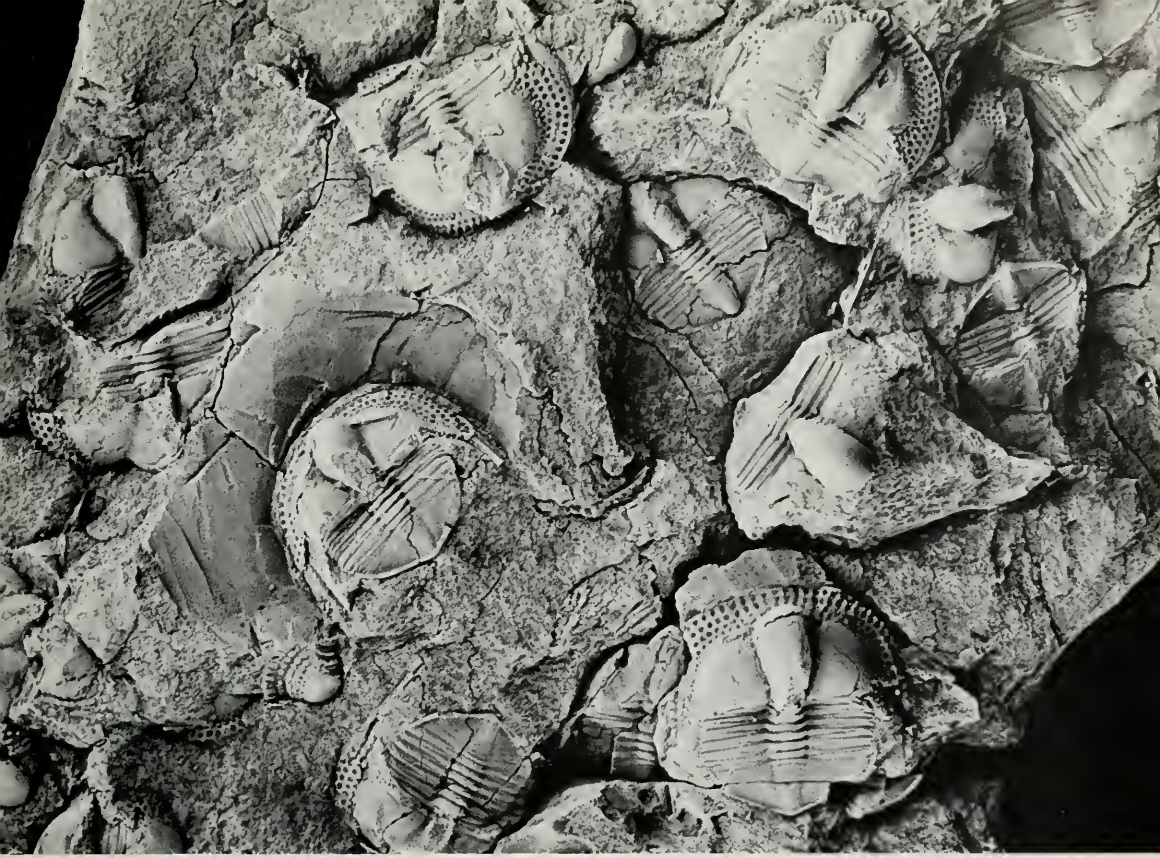
The illustrative material in this article is from Trilobites: A Photographic Atlas, *by Riccardo Levi-Setti, © 1975 by The University of Chicago, and reproduced by permission of the publisher. The introductory section, by E.N.K. Clarkson, is also from the book.* Trilobites: A Photographic Atlas *(213 pp., $27.50) may be ordered from the Field Museum Book Store—10% discount to members—or from the publisher.*



The would-be collector and student of trilobites is often limited in his endeavors by the paucity of really well preserved material for study. One does not often find perfect specimens. These occur only in certain rock-types in specific locales, some of which are no longer accessible. They may be difficult to extract from the matrix, and even in the best displayed museum specimens it is not easy to see the microscopic details of structure.—*Euan N.K. Clarkson, Grant Institute of Geology, Edinburgh.*

Some of these difficulties have now been overcome by Riccardo Levi-Setti, Professor of physics at the University of Chicago, Levi-Setti is also well known for his work on trilobites, on which he has authored a number of technical papers. In his recent *Trilobites: A Photographic Atlas*, Levi-Setti presents what may well be the most remarkable photographs ever made of these ancient creatures. The photographs reproduced here were selected from the book and represent a variety of techniques, including x-ray and color photography and the treatment of specimens with materials such as magnesium oxide and xylene, which selectively enhance the visibility of certain features. A number of Levi-Setti's subject specimens are in the Field Museum collection. —*Ed.*

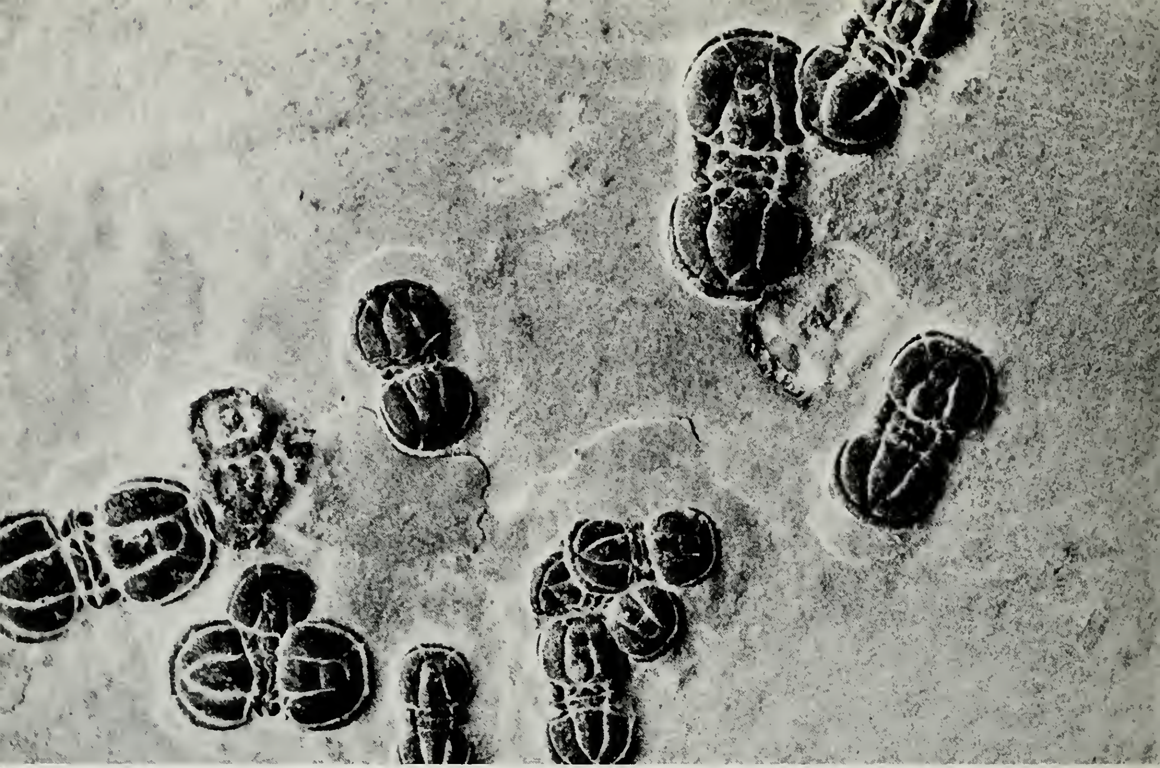




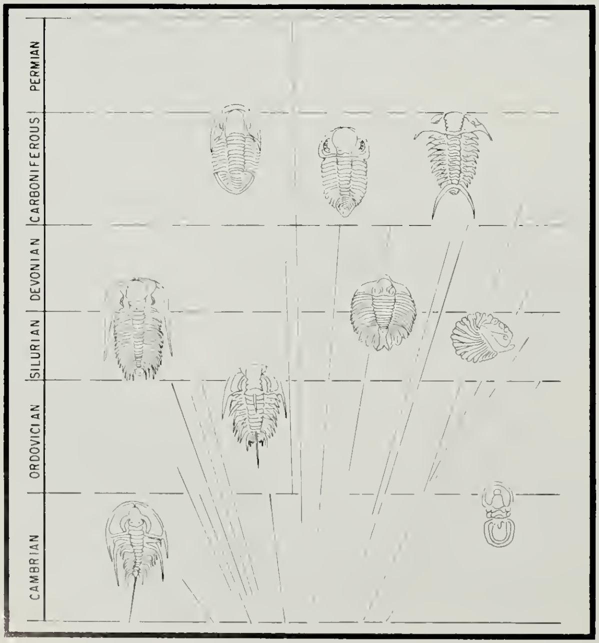
◄ Opposite page, top: Left eye of Phacops rana crassituberculata Stumm, from Silica shale of Middle Devonian age at Sylvania, Ohio. Photo by Riccardo Levi-Setti, specimen owner. Enlarged X14. (Detail)

▲ Specimens of Cryptolithus tesselatus Green from Pulaski shale of Middle Ordovician age, found in Lorain, Jefferson County, New York. Photo by R. Levi-Setti. Enlarged X2.8. Specimen from the J. Hall collection of the University of Chicago's Walker Museum, now housed at field Museum. Specimen whitened by magnesium oxide.

◄ X-ray view of Triarthrus eatoni (Hall), from Frankfort shale of Upper Ordovician age, at Rome, New York. Collection of American Museum of Natural History. X-ray negative by John Cisne. Photographic print by R. Levi-Setti. Enlarged X2.5 The biramous (two-branched) appendages can be seen protruding from and underlying the dorsal (back) shield. Soft internal structures can also be recognized. (Detail)

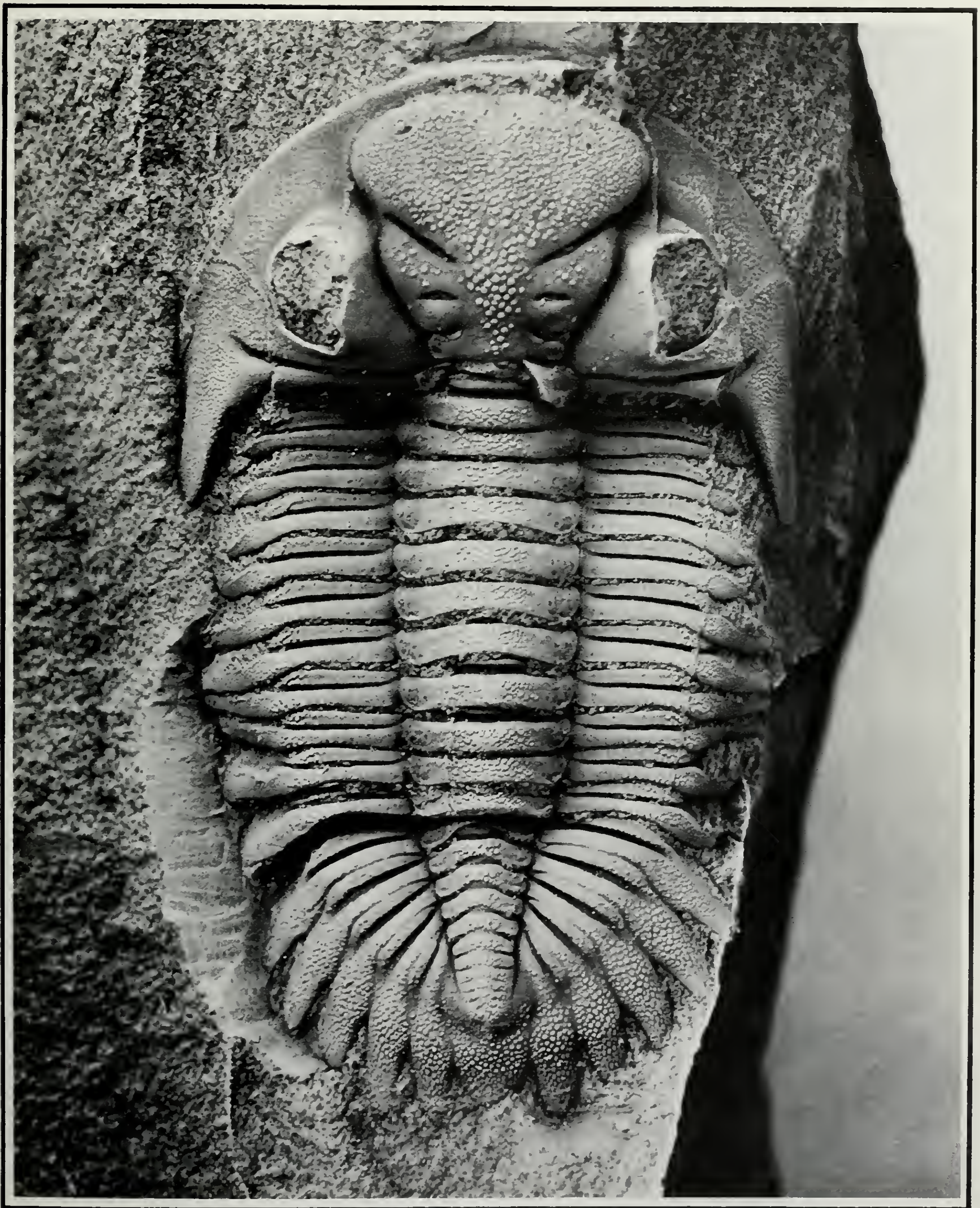


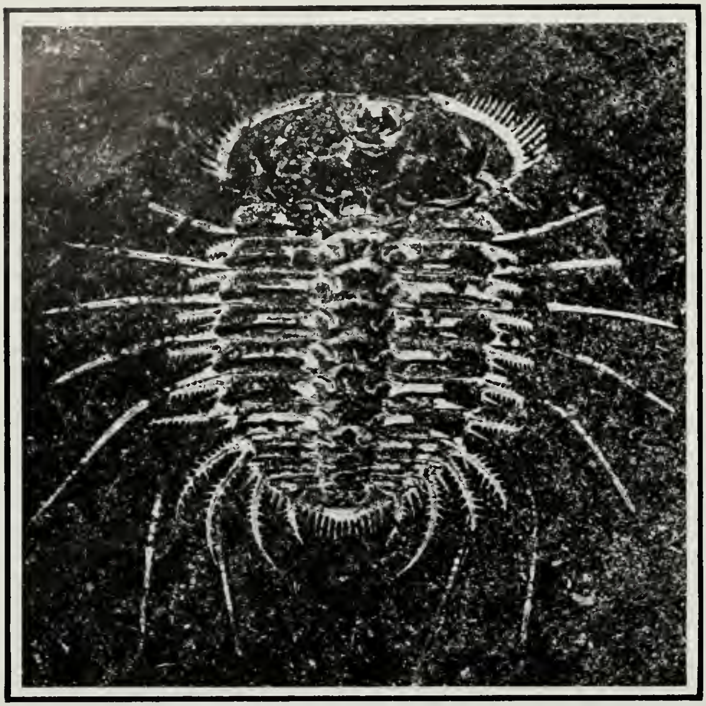
▲Specimens of Peronopsis interstricta (White), from Wheeler shale of Middle Cambrian age, found at Antelope Springs, Millard County, Utah. Photo by Riccardo Levi-Setti, specimen owner. Enlarged X6.3.



◄Outline of trilobite classification, after Bergström. Radiating lines indicate the geologic occurrence of the various groups. Trilobite drawings generally represent each major group. Clockwise, these are Olenellus, Paradoxides, Zacanthoides, Proetus, Zeliskella, Arctinurus, Ceraurus, Flexicalymene, and Peronopsis.

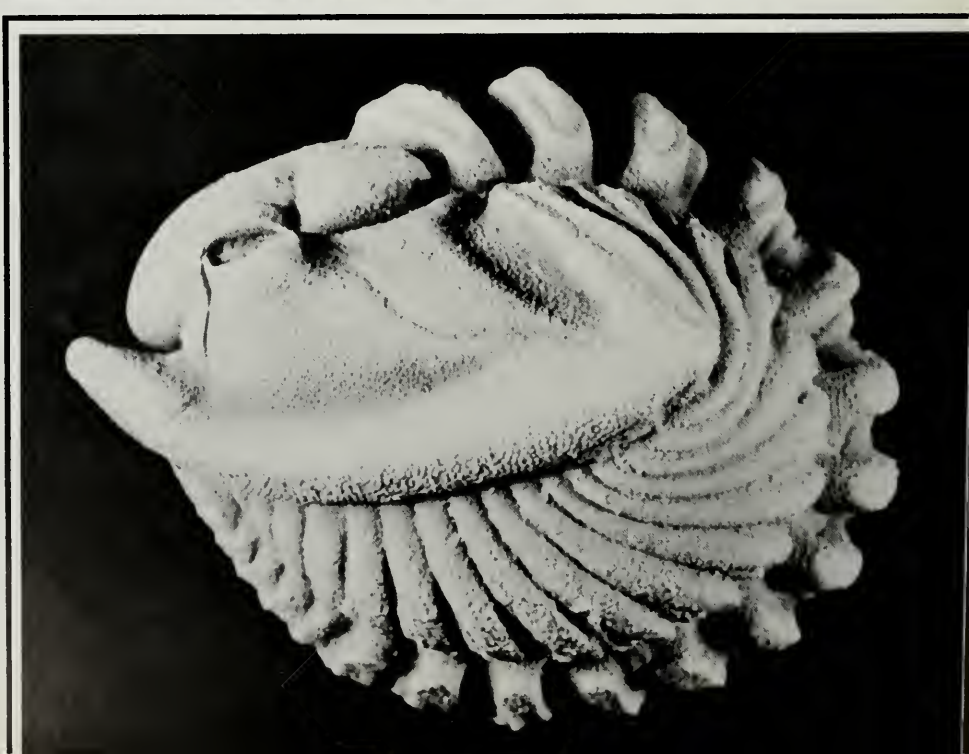
Greenops boothi (Green), from Windom ► formation, of Devonian age, from Windom, N.Y. Specimen at Orton Museum, Ohio State University. Photo by R. Levi-Setti. Enlarged X4. Specimen coated with magnesium oxide, emphasizing surface details.





◄ Miraspis mira (*Barrande*) from *Motol* beds, of *Middle Silurian* age, from *Bohemia*. Photo by *R. Levi-Setti*, specimen owner. Enlarged X5.6. Characteristic of this species is two types of spines on each pleural segment; one is long and slender, the other shorter and barbed.

Flexicalymene meeki (*Foerste*), of Ordovician age, from Waynesville, Ohio. Photo by Riccardo Levi-Setti. Enlarged X10. Specimen is beautiful example of species' ability to assume tightly enrolled posture. ▼



Environmental Film Series

"Environment: The Sum of Its Parts"

A presentation of the Ray A. Kroc Environmental Education Program and National Endowment for the Humanities

April through August 1976

Films in this series either expand on topics in the "Man in His Environment" exhibit or introduce concepts not dealty with in the exhibit. Several films relate other Museum exhibits to Man In His Environment. Screenings will be at 11:00 a.m. and 1:00 p.m. on Fridays, Saturdays, and Sundays in the Meeting Room, second floor north. More than 350 films were previewed to present these selections.

APRIL

Ecosystems: films dealing with a variety of natural communities.

2, 3, 4:	*Mzima: Portrait of a Spring*
9, 10, 11:	*The Salt Marsh. A Question of Values* *Ecology: Olympic Rain Forest*
16, 17, 18:	*The Sea*
23, 24, 25:	*Survival on the Prairie*
30:	*The Great Barrier Reef*

MAY

Adaptations for survival: special adaptations of flora and fauna, their relationships to each other and to the environment.

1, 2:	*The Great Barrier Reef*
7, 8, 9:	*Baobab: Portrait of a Tree*
14, 15, 16:	*Birds Paradise: The Waddensea*
21, 22, 23:	*Life in a Tropical Forest*
28, 29, 30:	*Polar Ecology: Predator and Prey*

JUNE

An endangered animal: the whale. A series showing the behavior and adaptations of several species of whales in the Atlantic and Pacific Oceans.

4, 5, 6:	*In Search of the Bowhead Whale*
11, 12, 13:	*Whales*
18, 19, 20:	*Whales, Dolphins, and Men*
25, 26, 27:	*After the Whale*

JULY

Human alternatives: key environmental problems that we now must face.

2, 3, 4:	*But Is This Progress?*
9, 10, 11:	*The Great Sea Farm* *Should Oceans Meet?*
16, 17, 18:	*Energy: A Matter of Choice*
23, 24, 25:	*Multiply and Subdue the Earth*
30, 31: Aug. 1:	*Pollution—A Matter of Choice*

AUGUST

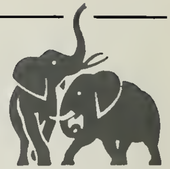
The question of tomorrow: documentary and fantasy versions of what the future can hold for us.

6, 7, 8:	*Eggs* *Technology: Catastrophe or Commitment*
13, 14, 15:	*Future Shock*
20, 21, 22:	*The Unexplained*
27, 28, 29:	*Coping with Tomorrow: Superconductors* *Man in the Second Industrial Revolution*

A film bibliograpy is available for one dollar ($1.00) by writing to Environmental Films, Field Museum.

This series will be repeated in coming months with revisions to bring you the best and newest in environmental film.

Volunteers Honored



February 11 was "V Day" at Field Museum: 212 volunteers were honored at a reception-dinner for their dedicated service to the Museum in 1975. Altogether, they logged a total of 28,574 hours during the year—equivalent to the time of seventeen full-time staff members. Fourteen more volunteers were involved than in 1974, with an increase of 389 additional hours of service.

Volunteers serve in the museum's departments of anthropology, botany, geology, zoology, education, exhibition, and in the library. Their activities range from cataloguing, to fossil-preparation, working with school groups, research assistance, and photography. Currently eighteen volunteers are involved in the Museum's weekly Saturday Discovery Program, which includes tours, demonstrations, and participatory activities.

Volunteers who contributed the greatest number of hours in 1975 were: James Swartchild (Anthropology), 1,351 hours; Alice Schneider (Anthropology), 1,168 hours; and Sol Gurewitz (Anthropology), 1,046 hours.

Those who gave more than 600 hours of their time were: Helen Voris (Zoology), Walter Mockler (Geology), Louva Calhoun (Anthropology), and Blair Winter (Zoology). Volunteers in the 400 to 600 hour category were: John O'Brien (Education), Le Moyne Mueller (Zoology), and Robert Hicks (Geology).

Other top-ranking volunteers were: Lalchumi Ralte (Anthropology), Peter Gayford (Anthrolopogy), Stewart MacLeod (Anthropology), M.E. Rada (Anthropology), Alyce DeBlase (Zoology), and Dorothy Stevenson (Zoology).

The Field Museum welcomes still more volunteers to help with expanding programs in many of its departments. For more information call or write the museum's department of education, 922-9410, ext. 351.

The volunteer program is funded in part by the Illinois Arts Council, a state agency.

1975 VOLUNTEERS:

Brian Adilman
Vija Alchimouics
Sydney Allport
Ann Andersen
Carrie F. Anderson
Cleo M. Anderson
Gretchen Anderson
Jean Armour
Judith Armstrong
Gwen Barnett
Rae Barnett
Dodie Baumgarten
John Bayalis
Virginia Beatty
Marvin Benjamin
Phoebe Bentley
Leslie Beverly
David Blanchard
Betty Blum
Idessie Bowens
Carol Briscoe
Joyce Brukoff
Beth Buchsbaum
Royal Buscombe
Douglas Buzard
Louva Calhoun
Jean W. Cameron
Theresa Cartmell
Jean Carton
Stana Coleman
Sharon Counts
Velta Cukers
Mary Agnes Curran
James Czarnik
Betsy D'Angelo
Georgette D'Angelo
Lucy Davis
Alyce DeBlase
Joseph de Cristofaro
Marianne Diekman
Delores Dobberstein
Marybeth Dowell
Karen Duckett
Eleanor G. Dugdale
Stanley Dvorak
Millie Dybas
Alice Eckley
Bonnie Eiber
Anne Ekman
Lee Erdman
Arista Francis
Gerda Frank
Arden Fredrick
Grace Fuller
Ida Gabler
Peter Gayford
Nancy Gerson
Betty Lou Girardi
Anita Goldberg
Lorna Gonzales
Helen Gornstein
Anne Goudvis
Stacia Greenberger
Victoria Grigelaitis
Paul Gritis
Karen Grossman
Sol Gurewitz
John Hager
Gertrude Hannen
Hetty Harris
Lois Hewitt
Peter Hewitt
Robert Hicks
Audrey Hiller
Harold Hilton
Barbara Hoff
Ralph M. Hogan
Claxton Howard
Dorothy Huff
David Humbard
Lois Hurd
Julie Hurvis
Ellen Hyndman
Frederica Irvin
Bruce Jayne
Bridget Jennings
Palmira Johnson
Malcolm Jones
Julia Jordan
Dorothy Karall
Martin Karant
Adria Katz
Myrette Katz
Marian Keith
Shirley Kelley
Marjorie King
Genevieve Kline
Karen Kohn
John Kolar
Laurie Kosky
Allan Koss
William Krueger
Michael Kuby
William Lange
Alfreda Leisz
Anne Leonard
Leah B. Levin
Elizabeth Lilly
Leslie Lipschultz
Margaret S. Litten
Ruth Loucks
Martha Lussenhop
Susan Lynch
Stewart J. MacLeod
Edna MacQuilkin
Dorothy Magos
Catherine Majeske
Millicent Marks
Margaret Martling
Darlene Marzullo
Charles A. Matza
Melba H. Mayo
Betty McClelland
Cecily McNeil
Withrow Meeker
Jeff Melvoin
Margot T. Merrick
Walter Mockler
Wiley & Karen Moore
Karen K. Morris
Henry Moy
Carol Mudloff
Tom Mudloff
LeMoyne Mueller
Irene Mullen
Arlene Nagy
Mary Naunton
Nancy Nelson
Natalie Newberger
Herta Newton
Bernice Nordenberg
John Nugent
Janis O'Boye
John C. O'Brien
Karen Olander
Joan Opila
China Oughton
Anita Padnos
Rebecca Pare
Raymond Parker
Susan Parker
Sally Parsons
Hazel Pensock
Helen Pfeifer
Ron Phillips
Daniel Polikoff
Joan Pomaranc
Susan Pratt
Ann Prewitt
Elizabeth Rada
M.E. Rada
Lalchumi Ralte
Edgar Reiter
Turi Reiter
Jill Reynolds
Sheila Reynolds
Yvonne Robins
William E. Roder
Noreen Rodman
Pat Rogers
Barbara Roob
Marie Louise Rosenthal
Hilde Sachs
Esther S. Saks
Bonita Samuelson
Alice Schneider
Rose Schrader
Betsy Schwartz
Beverly Scott
Alice Seeburg
Laura Seidman
Ann Shanower
Albert Shatzel
Phyllis Sidwell
Ann Sieron
Gertrude Silberman
Alexander Solt
Irene Spensley
George Speros
Llois Stein
Christine Stepan
Lorain Stephens
Lucille Stern
Dorothy Stevenson
Beth Stoneburg
Beatrice Swartchild
James H. Swartchild
Patricia Talbot
Dana Triester
Edith Turkington
Paulamaria Vasquez
Barbara Vear
Jean Von Blohn
Helen Voris
Sandra Walchuk
David Wend
Louise D. White
La Donna Whitmer
Phyllis Wiley
Blair Winter
Jan Wisseman
Reeva Wolfson

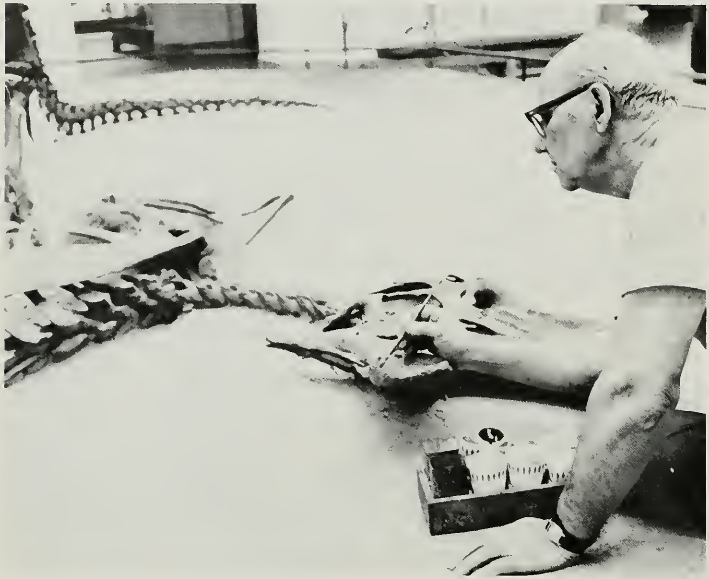
Above: members of the North Shore Weavers' Guild, who regularly provide weaving demonstrations in the South Lounge. Front row: Leslie Beverly, Anne Ekman, Julia Jordan; back row: Alice Eckley, Velta Cukers, La Donna Whitmer, Ann Shanower, Laurie Kosky.

Above: Museum staff members at the buffet: Roberta Becker (left) and Helen Kennedy (right), both of the Department of Botany. Below, left to right: volunteers Cleo M. Anderson (Mammals), Idessie Bowen (Publications), and Carrie F. Anderson (Publications).

Above: Volunteer Alyce DeBlase (Mammals) receives from Director E. Leland Webber special gift awarded to each volunteer. Below: Louva Calhoun, who gave more than 600 hours to the Department of Anthropology, receives her gift.

Field Museum of Natural History

field briefs



A TOUCH-UP FOR LAMBEOSAURUS

Above, Orville "Gilly" Gilpin, chief preparator, Department of Geology, touches up the skull of *Lambeosaurus*, one of two dinosaurs on exhibit in Stanley Field Hall. Since Gilpin helped install them in 1956, the dinosaurs have been popular with youthful, would-be, souvenir hunters as well as with camera buffs. In spite of the watchful eyes of guards, an occasional youngster manages to slip over the guard rail just long enough to discover that the fossilized bones are fixed rigidly in place. What damage is done can usually be repaired by a few deft strokes of Gilpin's paintbrush.

CORRECTION

"Fish Collecting in Belize," which appeared in the January 1976, *Bulletin*, was jointly authored by David W. Greenfield and Terry Greenfield. The article's by-line incorrectly credited David W. Greenfield as sole author. Mrs. Greenfield is an associate of the Department of Biological Sciences at Northern Illinois University.

NATURE CAMERA CLUB

Under the auspices of the Nature Camera Club of Chicago, a slide-lecture, "Africa Revisited," will be presented at Field Museum on Tuesday evening, March 9, by Harry G. Hirsch, well known photographer of African wildlife. This particular program will feature the cheetah. The slide presentation will be the first in the United States to utilize the new Leitz Convar Slide Projection System. The meeting begins at 7:30. Guests are welcome.

MURAL REPRODUCTIONS

Visitors who have expressed an interest in obtaining a copy of the biome mural by Kinuko Y. Craft on view in area six of the Man in His Environment exhibit, may now obtain reproductions (about 5 feet long) of the mural for $1.00 each at the Field Museum Book Store. These are reprints of a reproduction that appeared in the March 1976 *Smithsonian*. The reproduction may also be ordered, at the same price, from *Smithsonian*, 900 Jefferson Drive, Washington, D.C. 20560.

BLACKBALL MINE (*from p. 5*)

even though infected with rabies; because of this ability bats are of special value to scientists studying the etiology of the disease. But an uninformed public, frightened by over-publicized but isolated cases of rabies, have burned, stoned, or clubbed dormant bats by the hundreds and thousands. At Blackball Mine such senseless destruction and the general disturbance of bats living there has increased simply because the site has rapidly become a popular public attraction. Today, the survival of the entire colony is threatened.

Henry David Thoreau once observed that "a community is saved not so much by the righteous men in it but by the woods and marshes that surround it." With respect to the Indiana bat, the Department of the Interior, Fish and Wildlife Service, has proposed that Blackball Mine be declared a critical habitat—an area where there is adequate space for normal growth, movement, or territorial behavior; where nutritional requirements can be met; and where there are sites for breeding, reproduction, or rearing of offspring with adjacent cover and shelter. Within this concept, the destruction, disturbance, modification, curtailment, or subjection to human activity of habitat considered critical would not conform with the Endangered Species Act of 1973. If Blackball Mine is determined by the government to be a critical habitat area, all federal departments and agencies would be required to ensure that actions authorized, funded, or carried out by them do not result in the destruction or modification of the habitat.

We can only hope that the federal government acts to designate Blackball Mine as a critical habitat and that the state of Illinois will take positive action to acquire the mine as a unique natural area.

SUGGESTED READING

Allen, G.M 1939 (1962 reprint). *Bats*, New York: Dover Press, 368 pp.

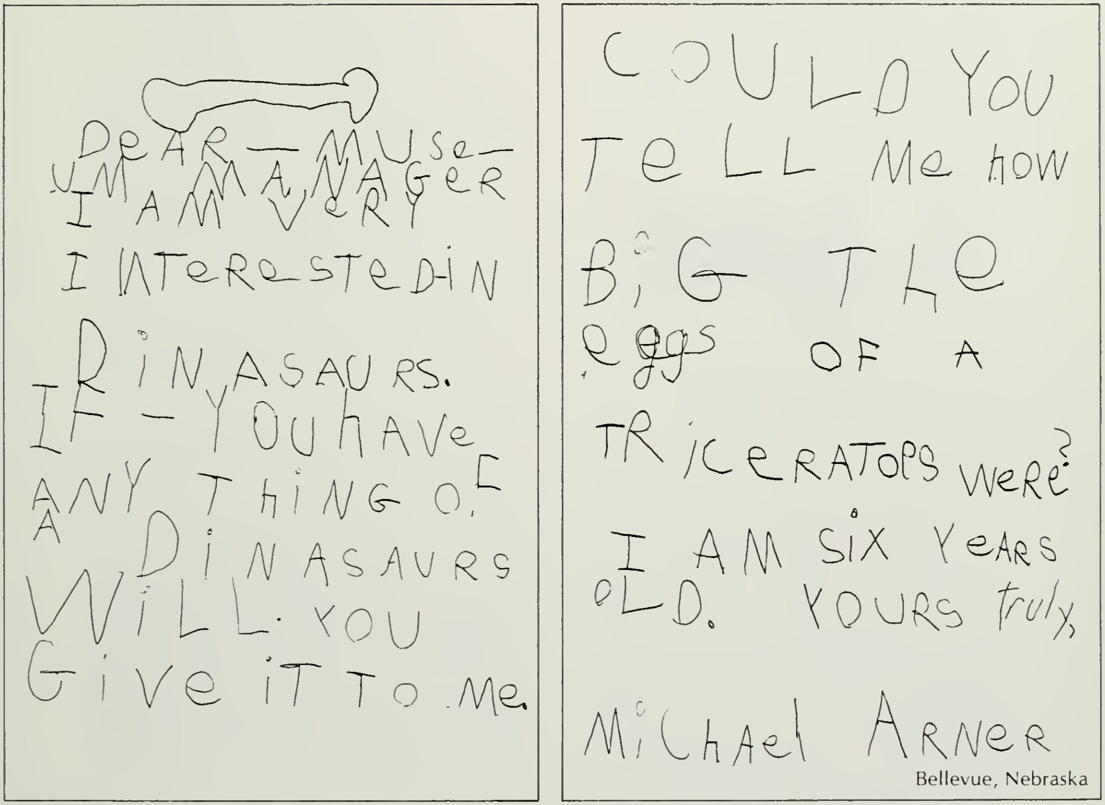
Barbour, R W. and W.H. Davis. 1969. *Bats of America*, Lexington: University of Kentucky Press, 286 pp.

Cady, G H. 1919. "Geology and Mineral Resources of the Hennepin and LaSalle Quadrangles." *Illinois State Geological Survey Bulletin* 37:1-136.

Greenhall, A.M. 1973. "Indiana Bat—A Cave Dweller in Trouble," *National Parks and Conservation Magazine*, Vol. 47, No. 8.

letters

FROM A YOUNG PALEONTOLOGIST:



Dear Museum Manager
I am very
interested in
Dinasaurs.
If you have
any thing of
a Dinasaurs
will you
give it to me.

Could you
tell me how
big the
eggs of a
Triceratops were?
I am six years
old. Yours truly,

Michael Arner

Bellevue, Nebraska

Dear Michael:

Thank you for your letter.

Field Museum has a whole hall full of dinosaur skeletons. I am enclosing some postcards that show how an artist thought dinosaurs looked. I hope you can come to the Museum one day to see them yourself. I should tell you that sometime within the next couple of years, the dinosaur hall will be closed for renovation. This means that painters will paint the walls, exhibit preparators will clean the glass, and museum scientists will write new labels. The dinosaurs themselves will stay the same!

I asked Dr. John Bolt, the scientist in charge of dinosaurs, how big the eggs of a triceratops were. He says that no one has ever found a whole triceratops egg. Protoceratops, a dinosaur smaller than triceratops but related to it, laid eggs that were 5 inches long and about 3 inches in diameter. Triceratops eggs were probably bigger than that.

You drew a fine picture of a dinosaur bone!

Sincerely,

Alice Carnes
Chairperson
Department of Education
Field Museum

MARCH at Field Museum

NEW PROGRAMS

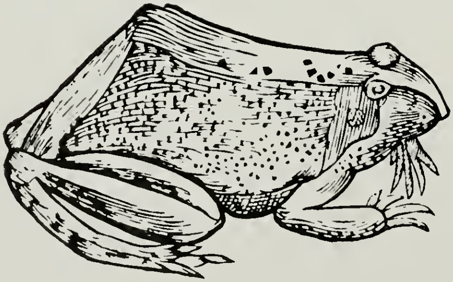
ILLUSTRATED LECTURE SERIES

"FOCUS: PEOPLE IN THE MAINSTREAM." Illustrated lecture series in conjunction with the *Man in His Environment* exhibit (see below). Presented by people actively involved in some aspect of the environment. Fridays at 7:30 p.m.; repeated on Saturdays at 2:30 p.m. Ground floor lecture hall.

March 5 and 6: *Man First? Man Last? The Meaning of Natural Diversity to Human Evolution,* by botany professor Hugh H. Iltis.
March 12 and 13: *Landscape: Some Visual Dimensions of Environment,* by author/photographer Charles F. Davis.
March 19 and 20: *The Sun Gave Man the Power,* by film producers Rob and Joan Root Ericksen
March 26 and 27: *The Flickering Flame,* by environmental reporter Harlan Draeger.

SPRING JOURNEY FOR CHILDREN

"ESKIMO HUNTERS." A free self-guided tour through Eskimo-related halls, including a "hunt" through the museum's newest exhibit, 19th Century Alaskan Eskimo Art. Colorful tour sheets provide questions and space for drawing; helping children interpret the exhibits they see. All children who can read and write are invited to participate. Journey sheets in English and Spanish are available at the information booth. Bring pen or pencil.



SATURDAY DISCOVERY PROGRAM FOR CHILDREN AND ADULTS

NEW EVENTS have been added to the continuous stream of tours, demonstrations, and participatory activities offered every Saturday, from 11:00 a.m. to 3:00 p.m., as part of the museum's Discovery Program.

Prehistoric Animals—A half-hour tour explores the history and evolution of dinosaurs and other vertebrate animals.

Art and Culture of the Northwest Coast—A one-hour program features a film, followed by a guided tour of totems and masks in the museum's collections.

Endangered Animals—A half-hour tour focuses on species in danger of extinction.

Other Discovery activities include the popular clay dinosaur modeling in the Hall of Dinosaurs (take your model home), and the half-hour tour through the Egyptian collection—which also explains the "how's" and "why's" of mummy-making.

For specific times for each of the above events, phone the museum, or inquire on arrival at museum entrances.

SPECIAL EXHIBITS

BICENTENNIAL EXHIBIT

"MAN IN HIS ENVIRONMENT." The most talked-about environmental exhibit in the country. The exhibit deals first with natural systems and second with man's impact on them—leading to the inescapable conclusion that man is not the independent master he so easily assumes himself to be, but one of earth's creatures, as dependent upon the environment as any other creature. *Man in His Environment* takes a global view of the most serious problems now confronting all mankind and asks visitors to involve themselves in decisions that have to be made.

ESKIMO ART EXHIBIT

"19TH CENTURY ALASKAN ESKIMO ART." In the early to mid-19th century, traditional Alaskan Eskimo carving and engraving on ivory and wood reached special peaks of development. Art was inseparable from Eskimo life; and the most commonplace articles were fashioned and decorated in ways that were aesthetically beautiful. But the 1890s brought European and American gold prospectors swarming to Alaska; and Eskimo artists began producing a new art on demand: souvenirs. Come and compare the new with the traditional in this stunning new exhibit.

Public tours of the exhibit are offered every Tuesday at 11:00 a.m. and 1:00 p.m., through June 29. Meet at exhibit entrance (Hall 27).

CONTINUING PROGRAMS

ENVIRONMENT FILM SERIES

"ENVIRONMENT: THE SUM OF ITS PARTS." Offered in conjunction with the *Man in His Environment* exhibit. The March theme is "The Question of Tomorrow: documentary and fantasy versions of what the future can hold for us." Films are shown at 11:00 a.m. and 1:00 p.m. in the Meeting Room, second floor north. New series begins in April. (See "Coming in April," below.)

March 5, 6, 7:	*Future Shock* (42 min.)
March 12, 13, 14:	*The Unexplained* (52 min.)
March 19, 20, 21:	*Technology: Catastrophe or Commitment* (22 min.) *Urbanissimo* (6 min.)
March 26, 27, 28:	*Energy to Burn* (20 min.) *Man and the "Second" Industrial Revolution* (19 min.)

ESKIMO FILM PROGRAM

CONTEMPORARY CANADIAN ESKIMO ART AND ARTISTS are illustrated in three films which can be seen daily at 12:00 noon. For location, inquire at entrances.

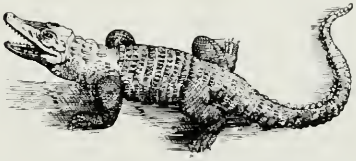
Eskimo in Life and Legend (23 min.) The story of a great hunter who carved the image of his wish from a chosen piece of stone—and saw the wish come true.

Eskimo Artist Kenojuak (19 min.) Kenojuak, artist, wife, and mother, makes her drawings when she is free of the duties of trail or camp. Her thoughts are spoken as commentary for the film and add to our understanding of the images she creates.

Kalvak (20 min.) As a child, Kalvak, now a sixty-eight-year-old Eskimo woman, traveled on many long hunting trips with her parents. She uses the subjects of these experiences which give her beautiful, sensitive drawings a strong environmental emphasis.

WEAVING DEMONSTRATIONS

THE ANCIENT ART OF WEAVING on a two-harness, handcrafted Mexican floor loom, demonstrated by members of the North Shore Weavers' Guild every Monday, Wednesday, and Friday, 10:30-11:30 a.m. and 12:00-1:00 p.m. On Mondays, March 1 and 15, the demonstrations include spinning. South lounge, second floor.



SPECIAL INTEREST MEETINGS

March 2, 7:30 p.m.	*Kennicott Club* (meets first Tuesday of each month)
March 5, 8:00 p.m.	*Chicago Anthropological Society* (meets first Friday of each month)
March 9, 7:30 p.m.	*Nature Camera Club*
March 10, 7:00 p.m.	*Chicago Ornithological Society*
7:30 p.m.	*Windy City Grotto, National Speleological Society*
March 14, 2:00 p.m.	*Chicago Shell Club*
March 16, 7:30 p.m.	*Chicago Audubon Society*

COMING IN APRIL

"ENVIRONMENT: THE SUM OF ITS PARTS." A film series in conjunction with the *Man in His Environment* exhibit, offered April 2 through August 29. Topics are: "Ecosystems" (April), "Adaptations for Survival" (May), "An Endangered Animal: The Whale" (June), "Human Alternatives" (July), "The Question of Tomorrow" (August).

MARCH HOURS

THE MUSEUM opens daily at 9:00 a.m. and closes at 5:00 p.m. every day except Friday. On Friday, year-round, the museum is open to 9:00 p.m. Food service areas are open weekdays 11:00 a.m. to 3:00 p.m., weekends to 4:00 p.m.

THE MUSEUM LIBRARY is open 9:00 a.m. to 4:00 p.m., Monday through Friday. Please obtain pass at reception desk, first floor north.

MUSEUM TELEPHONE: 922-9410

April
1976

Field Museum of Natural History Bulletin

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CONTENTS

3 OUR ENVIRONMENT

10 FIELD MUSEUM: 1921 AND 1976
A New Lease on Life for the
55-year-old-Building

12 IROQUOIS PRAYER: INTENTION AND ANTICIPATION
by David Blanchard

18 FIELD BRIEFS

19 SCANNING ELECTRON MICROSCOPY
Summer Workshop

20 WEEKEND FIELD TRIP FOR GEOLOGY BUFFS

21 WILDERNESS CANOE TRIP

22 APRIL AT FIELD MUSEUM
Calendar of Coming Events

COVER PHOTO

Springtime comes to Illinois Beach State Park. Photo by Janet Kolar.

PHOTO AND ART CREDITS

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Our Environment

Horses Displace Native Wildlife

Wild horses and burros are continuing to displace native wildlife in many areas of the West, the Wildlife Management Institute reports. Their numbers have doubled since 1971 and are growing at about 20 percent each year. Current inventories show that there are 50,000 wild horses and 5,000 burros on public lands in the West. Oregon alone has about 7,000 wild horses.

In some areas, wild horse and burro populations have grown beyond the land's carrying capacity. Vegetation is being destroyed and wildlife is suffering, reports the Institute. One important elk winter range in Oregon has been nearly denuded by excessive grazing by wild horses. Waterholes are gradually becoming mudholes by trampling and wallowing of wild horses in Oregon's Lakeview District. Forage desperately needed by endangered bighorn sheep is being consumed by wild horses and burros.

The Bureau of Land Management has found it impossible to curtail the number of wild horses because of restrictions imposed by the 1971 Wild Horse and Burro Act. That Act prohibits the use of motorized vehicles to capture wild horses. BLM has tried to remove excess animals with saddle horses, but has had little success. During the past eighteen months about 400 wild horses have been removed from Oregon rangelands. The cost has varied from $300 to $800 for each horse. In order to protect wildlife habitat and other rangeland values, BLM needs to remove 1,368 wild horses this year in Oregon. That would cost about $500,000—more than 10 times the amount spent by BLM this fiscal year on wildlife projects in that state. Several saddle horses have been killed or injured and three BLM riders were seriously injured during the roundups so far.

BLM is seeking changes in the 1971 law which would permit the use of helicopters to trap wild horses and provide authority to transfer ownership of captured horses to private citizens. BLM says helicopters would be much cheaper and more humane to the animals and to BLM riders and horses. ►

Canada geese flushed from corn field

Propose Horicon Goose Reduction

The U.S. Fish and Wildlife Service and the Wisconsin Department of Natural Resources will deemphasize management concepts that now encourage further development of the Canada goose concentration in east-central Wisconsin. The two agencies propose to reduce goose use of Horicon Marsh, the nucleus of Canada goose activity in that part of the state. The service and the Wisconsin DNR manage the goose population under an advisory overview of the Mississippi Valley Flyway Council. The objective of the joint management effort is to reduce the peak goose concentration at Horicon Marsh to 100,000 by 1980.

Since the late 1930s, management of the Horicon goose flock, has been a notably successful enterprise. The Mississippi Valley population increased from 45,000 in 1936 to recent post-hunting season peak populations of 300,000. The portion of the population using east-central Wisconsin mushroomed from zero population in 1940 to recent peak numbers exceeding 200,000 birds.

Before the concentration can be reduced, adjustments in the land and water features at Horicon would have to be made. Under the proposal, now in the work plan stage, lowland browse croplands would be permitted to revert to natural moist soil plant growth to reduce the availability of roosting and feeding areas. Dewatering strategic portions of the marsh is another measure of the goose-management proposal.

Anthony Earl, secretary of the Wisconsin DNR, says the cooperative effort will focus on "reducing the peak concentration—not the population." "Our chief concern is the resource," says Earl. "Better distribution of the geese would reduce the potential threat of disease to the flock." State and federal waterfowl managers fear the tight concentration makes the birds vulnerable to diseases such as fowl cholera and duck viral enteritis. It is also believed that thinning the concentration would help alleviate crop losses in the private sector.

An important factor in altering the population is weather. In dry years farmers normally harvest crops before the migrant geese congregate in the area, while in wet years, the birds may have an opportunity to pilfer some of the standing crops. Reducing goose use by 50 percent and dispersing the flock from the Horicon zone before December 5 is part of the strategy.

The manipulation plan to reduce the goose flock may benefit the local duck population. Upland agricultural fields on Horicon National Wildlife Refuge and all state-managed areas in east-central Wisconsin will be converted to dense nesting cover. Converted uplands, it is hoped, will be unattractive to geese but suitable for duck production.

In spite of the planned reduction, Wisconsin will still have a sizeable goose population, and to most observers, the proposed change in the goose population would not be apparent. The agencies have not ruled out an increase in the hunting quota for the Horicon zone. The statewide harvest quota for Wisconsin is 28,000 geese, of which 16,000 is assigned to the Horicon quota zone.

Bird Data Bank

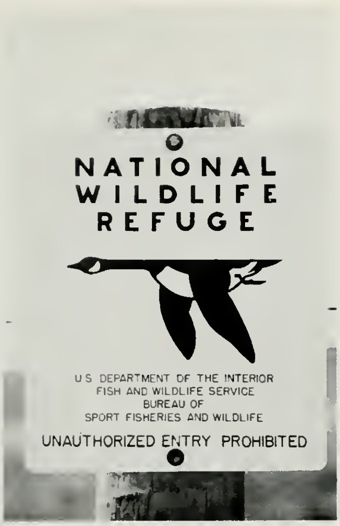
A computerized collection of information on the more than seventy species of colonially nesting birds is being established by the Cornell University Laboratory of Ornithology. The colonial bird register was organized to develop a computerized data base for the collection and dissemination of information concerning colonial birds. Individuals and agencies working with colonially nesting species are asked to contribute to the program's success by submitting field survey forms detailing the location of colonies, species composition, and other information. In turn, the Register will provide a centralized location for the information.

The survey forms are designed to require a minimum amount of time for the investigator to complete. Forms are supplied at no charge. They are available, to those in a position to provide information, from the Colonial Bird Register, Cornell Laboratory of Ornithology, 159 Sapsucker Woods Rd., Ithaca, N.Y. 14853.

Congress Acts against Blackbird

Blackbirds have returned by the millions to localized areas of Kentucky and Tennessee and the Department of the Interior has been empowered by Congress to authorize the treatment of roosts with chemicals registered for bird control purposes unless the treatment itself poses a hazard to humans.

Congress passed on January 28 an act to provide for starling and blackbird control in Kentucky and Tennessee. President Ford signed the bill into law on February 4.


NATIONAL
WILDLIFE
REFUGE
U S DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF
SPORT FISHERIES AND WILDLIFE
UNAUTHORIZED ENTRY PROHIBITED

The bill waives the provisions of the National Environmental Policy Act of 1969, the Federal Environmental Pesticide Control Act, or any other laws, for control actions undertaken in these two states before April 15, 1976.

Congress found that in Kentucky and Tennessee large concentrations of starlings, grackles, blackbirds, and other birds found in "blackbird roosts" pose a hazard to human health and safety, livestock, and agriculture. It further found that roosts are reestablished each winter and that dispersal techniques have been unsuccessful. Large concentrations of blackbirds produce droppings of 1 to 2 feet in depth under large roosts. This heightens the likelihood of humans contracting histoplasmosis—a serious infection of the trachea and bronchial tubes. Control, the bill stated, is most effective when birds are concentrated in winter roosts. Further, the bill pointed out, an emergency does exist which requires immediate action with insufficient time to comply with the National Environmental Policy Act.

The bill provides that upon certification by the governor of Kentucky or Tennessee to the Secretary of the Interior that "blackbird roosts" are a significant hazard to human health, safety, or property in his state, the Secretary of the Interior will survey roosts and authorize the treatment with chemicals registered for bird control purposes those roosts containing more than 500,000 birds, unless the treatment itself would pose a hazard to human health, safety, or property.

The Fish and Wildlife Service survey of 1975 reports that there were about 77 million blackbirds in Kentucky and Tennessee. The blackbird/starling population in North America reaches a low point of about 250 million birds in late April to early May each year. By July, when the reproductive season terminates, the population has more than doubled to about 550 million birds. Between mid-July and the following April, more than 300 million blackbirds/starlings die naturally, reducing the breeding population to the 250 million level of the previous breeding season. During the period of winter roosting (October-March), perhaps 200 million blackbirds/starlings die naturally.

The Fish and Wildlife Service breeding survey counts show that the breeding number of starlings and grackles have definitely increased over the last decade. Both starlings and grackles have benefited from land use changes caused by man.

Raptors: Progress Report

The annual U.S. Forest Service survey of bald eagles and ospreys on national forests in the Great Lakes area indicates that the eagle increased its numbers and that osprey held its own during 1975.

The number of young eagles known to have reached fledging age on the seven national forests was 192, nearly 30 more than in any previous year of the survey which has been conducted since 1964. The ospreys produced 102 young to fledging age. That is 16 less than last year. Biologists think several osprey nests were destroyed by windstorms and could account for the drop. In 1965 only 37 young eagles and 11 ospreys were found on the forests.

Record numbers of bald eagles and golden eagles wintered this year in southern Colorado's San Luis Valley, according to the National Audubon Society. Totals from a January 29 study indicated between 200 and 250 bald eagles and approximately 280 golden eagles in a 2,500-square-mile area. The survey team also noted approximately 150 American rough-legged hawks, small numbers of marsh and red-tailed hawks, and a lone prairie falcon.

The counts were made by the U.S. Fish and Wildlife Service, the Colorado Division

Osprey

of Wildlife, and the National Audubon Society. The San Luis Valley, a large mountain-rimmed desert basin, has traditionally wintered substantial numbers of eagles and other raptors. Temperatures 25° below zero are not uncommon in the valley during the long winters.

The biologists stated that it is unique to find a large concentration of bald eagles wintering in such a cold, arid region. Bald eagles normally spend the winter near large areas of open water such as flowing rivers or lakes.

It is obvious that the number of bald eagles has increased in the valley over the last five years, the biologists report. They attribute this to a combination of factors, including the ban on predator poisons on federal lands, a decline in illegal shooting, and possibly the prohibition of DDT.

Their survey also notes that the bald eagle population wintering in the Valley appeared in excellent health. Approximately 30 percent were immature birds, indicating that the eagles are reproducing well, and that survival of young is good.

Bald eagles were concentrated toward the western portion of the San Luis Valley, but with substantial groups on the lower Conejos River, and others along the Rio Grande River east and west of Monte Vista. All the birds are winter visitors only, and have already headed north to Canada and possibly Alaska where they breed and raise their young. No banding studies of the San Luis Valley bald eagles have been done, so the precise locations of their summer range is unknown.

The golden eagles were distributed widely over most of the Valley. Many are likely year-round residents of southern Colorado. They started moving out of the low-

lands in February, with local breeding pairs heading for the foothills and mountains to nest, and the nonresidents migrating to more northerly latitudes.

Like the bald eagle, the American rough-legged hawk is strictly a migrant and has already left the Valley for points as far north as the Noatak River in northwestern Alaska.

Feeding habits of these three species are different. The bald eagle prefers fish, both alive and dead, and carrion. Golden eagles depend heavily on rabbits, while the rough-legged hawk concentrates on smaller rodents such as field mice.

The January 29 survey was made in a light plane flying 500 linear miles of transect lines at an elevation of 150 feet above the ground. Transects were randomly selected to cover 10 percent, or 250 square miles of the 2,500 square-mile area censused. Raptors were counted one-quarter mile to either side of the flight line, then figures were extrapolated for the entire 2,500 square-mile area. January 29 was a clear, calm day—excellent for an aerial survey of this kind. Most of the birds were perched on telephone poles and in cottonwoods where they were easily spotted. On windy days, when eagles and hawks take to the air, accurate counting may be more difficult.

Peregrine Restoration Continues

A group of Cornell University ornithologists, aided by state, federal, and private support, are making encouraging progress restoring the endangered peregrine falcon in the wild.

Since 1973 the Peregrine Fund has raised 68 peregrines from captive parents. Last summer, 16 young peregrines were released in five eastern areas with remarkable success so far. The group has expanded operations to the West. Several prairie falcons have been released in Colorado and the western subspecies of peregrine is being produced for future releases.

Falconry Regulations

New regulations requiring Federal permits for falconers and setting standards for falconry—the ancient sport of taking quarry with trained birds of prey—have been re-

Broad-winged hawk

cently announced by the U.S. Fish and Wildlife Service.

The regulations, published in the *Federal Register,*

- require that persons entering the sport have a basic knowledge of raptor identification, biology, regulations, care, and training;
- establish three classes of falconry permits depending upon the individual's level of competence: apprentice, general, and master classes;
- set housing and marking requirements for raptors;
- identify species which can be used for the sport and set limits on the number of birds which can be removed from the wild (no endangered species can be used);
- establish minimum standards to be used by the states for issuing their falconry permits.

Federal regulations of falconry is required by a March 1972 convention between the United States and Mexico which extends federal protection to virtually all species of North American birds traditionally used for falconry. None can be possessed without a federal permit. Some of the more common species include the red-tailed hawk, prairie falcon, cooper's hawk, goshawk, kestrel, and Harris' hawk.

Falconry has been practiced for over 4,000 years and is increasing in popularity worldwide. An estimated 1,500 Americans actively engage in the sport, and the number is growing.

The sport of falconry is not allowed in some states. Where it is allowed, state regulations must conform with the minimum requirements stated in the federal regulations. The new rules became effective February 17.

Red-tailed hawk

Extinction Is Rule?

The long continued survival of a group of animals is a rare event, reports a geologist-geophysicist at the University of Minnesota. Robert E. Sloan has developed some intriguing information and theories on animal extinction during his years of studying the demise of dinosaurs. "Extinction is the rule rather than the exception," says Sloan, "and we can, if we choose, calculate a sort of half life of a species."

Approximately 20,000 species of vertebrates were alive 230 million years ago, according to Sloan, and only about two dozen of those have any living descendants now. Those two dozen, he continues, have nearly 50,000 species descended from them.

Globally, the temperature underwent a seven-degree centigrade reduction at all latitudes and doomed dinosaurs all over the world. That was not a severe change, Sloan says, but it was enough to destroy the dinosaur's habitat. "We found that very few things in those communities became extinct," he said. At the time, there were nine species of dinosaurs, two dozen mammals, and assorted reptiles and birds. "We found, to our great surprise, that the only things that became extinct were the nine dinosaurs and six or seven possums and two kinds of multituberculars (gnawing animals)."

"As dinosaurs became extinct, a very small percentage of placental mammals, essentially hedgehogs, developed rapidly to fill the role left by the dinosaurs. Over a span of nine million years, this very small group of mammals developed into the ancestors of bats, whales, pigs, sea cows, proto-elephants, rodents, primates, and all other 24 existing orders of placental mammals."

According to Sloan, no two species have become extinct for exactly the same reasons, but most extinctions are linked to the rapid expansion of the human population. Further population expansion of humans will force more species to the wall, Sloan says. He theorizes that man's extinction will also come.

Wyoming Fights for 1080 Use

The State of Wyoming again has gone to the U.S. District Court for a temporary restraining order to prevent the Environmental Protection Agency from issuing a stop-use order on compound 1080. Misuse of 1080 has killed many eagles and other non-target wildlife.

Last year the district court nullified EPA's suspension of 1080. An appeals court overturned that decision but Wyoming had already distributed baits laced with the deadly 1080 poison to control coyotes. EPA requested that the baits be retrieved, but Wyoming has refused so far, according to the Wildlife Management Institute.

Since the pending request for a restraining order to allow the use of 1080 will be heard by the same judge that issued the first order, it is feared by some conservationists that the state may receive a favorable ruling again.

"People Who Start Pollution Award" for Keep America Beautiful

At a "Counter-Awards Ceremony" which recently took place in conjunction with Keep America Beautiful's (KAB) annual meeting, environmentalists charged that KAB is an "industry front," and bestowed a special "People Who Start Pollution" award to that organization for its alleged efforts to cover up the environmental impact of throwaway beverage cans and bottles. The "Throwaway Society Award" was given to Coca-Cola for its promotion of the throwaway plastic bottle. Coca-Cola was singled out for having introduced this petroleum-based bottle during a period of national energy shortage.

Tom McCall, former governor of Oregon, was given the "People Who Stop Pollution Award" for his efforts in behalf of the Oregon Bottle Bill in 1970. All awards were presented on behalf of more than thirty national and state public interest organizations.

Chicago CO Level Hits Five-Year High

Carbon monoxide levels during 1975 in downtown Chicago reached their highest levels in the past five years. The highest reading violating the nine parts per million national health standard was an eight-hour average of 21 parts per million recorded Nov. 4, 1975.

The entire year's air quality data, collected by a continuous monitor operated by the City of Chicago's Department of Environmental Control, showed violations of the health standard during 21 percent of the eight-hour periods sampled.

Medical researchers have found that blood samples of people in downtown Chicago contain among the highest levels of carbon monoxide in the nation. The substance interferes with the blood's ability to carry oxygen and adversely affects the nervous and cardiovascular systems.

Michigan Dunes Area Closed to Traffic

The Nordhouse Dunes Area in Mason County Mich. will be permanently closed to motorized traffic effective this spring. Located in Grant Township about midway between Manistee and Ludington, the area was used extensively by off-road vehicles prior to its closure for study in October 1973.

According to the National Park Service, four alternatives for managing the area were established during the two-year study. They ranged from walk-in use only without trail development, to development of an ORV recreation area with area and number of users regulated. They were rated against management objectives for the area, the most important of which were public safety and maintaining the dunes' character.

Other objectives included effects on plant and animal communities, supply and demand for dune uses, disturbance to adjoining landowners and development costs.

Present plans for development of the area include a parking lot near the end of Nurnberg Road, and toilet and garbage collection facilities. Foot trails will also be developed.

Persons desiring more information about the decision should write the Forest Supervisor, Huron-Manistee National Forests, 421 S. Mitchell St., Cadillac, Mich. 49601.

"Quiet Day" for Grand Rapids

You don't have to tiptoe through Grand Rapids, Mich., on Quiet Day, but townspeople won't appreciate your making a lot of racket, either.

The observance began in 1974 when city fathers decided the future of the environment was not tied so much to court action as to the attitudes and awareness of the populace. The result was a proclamation by Mayor Parks naming September 27 the first annual "Quiet Day in Grand Rapids, Michigan."

Primary goal of the observance was to increase citizens' awareness of noise pollution and the need for its abatement. The Committee on Noise, composed of government officials, educators, audiologists, motorcycle dealers, police officers, and an acoustical engineer, took responsibility for the development and execution of Quiet Day.

From the original idea of a low-keyed program, Quiet Day eventually emerged as a multi-faceted one, so much so that the committee decided to set aside Riverside Park in Grand Rapids for the day's activities.

Before the day was out, scores of citizens had brought their autos in for noise level tests by the Grand Rapids Environmental Protection Department, and also took free hearing tests administered by a local audiologist.

City officials conceded it was difficult to accurately measure the success or effectiveness of a program such as Quiet Day. However, they noted that the area schools displayed a marked interest in noise pollution and what they could do about it. More than 25 of them asked the Grand Rapids EPA to provide speakers to discuss noise abatement.

Viruses Fight Insects

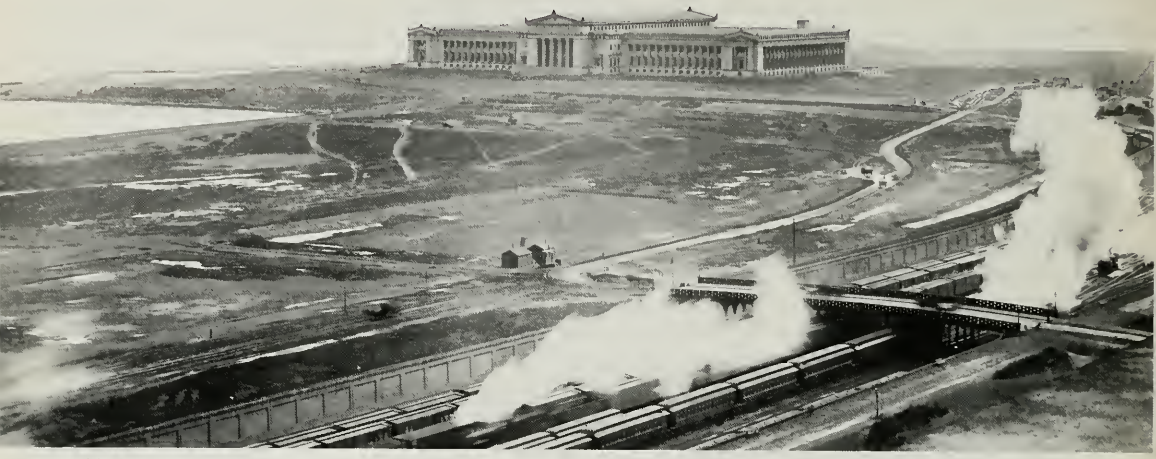
A virus which occurs naturally in insects has now been registered as an insecticide by the EPA, meaning the product has met extensive test requirements for safety and effectiveness.

It is approved for use against two highly destructive cotton pests—the cotton bollworm and tobacco budworm. The virus is naturally present in those two insects and tests have shown that it presents a minimal hazard to persons applying the insecticide.

The virus product also appears to have no adverse effects on beneficial insects, birds or other wildlife that help keep other cotton pests under control. This specificity of the insecticide is a major environmental advantage over chemical pesticides approved by EPA for cotton use.

Other environmental benefits are that the insecticide becomes harmless shortly after application and that it is not capable of building up in the bodies of birds or other wildlife that might eat the treated insects.

The insecticide is produced by raising diseased bollworm and budworm insects in a laboratory, then extracting the virus and mixing it with other materials. It may be applied by either ground equipment or airplane.



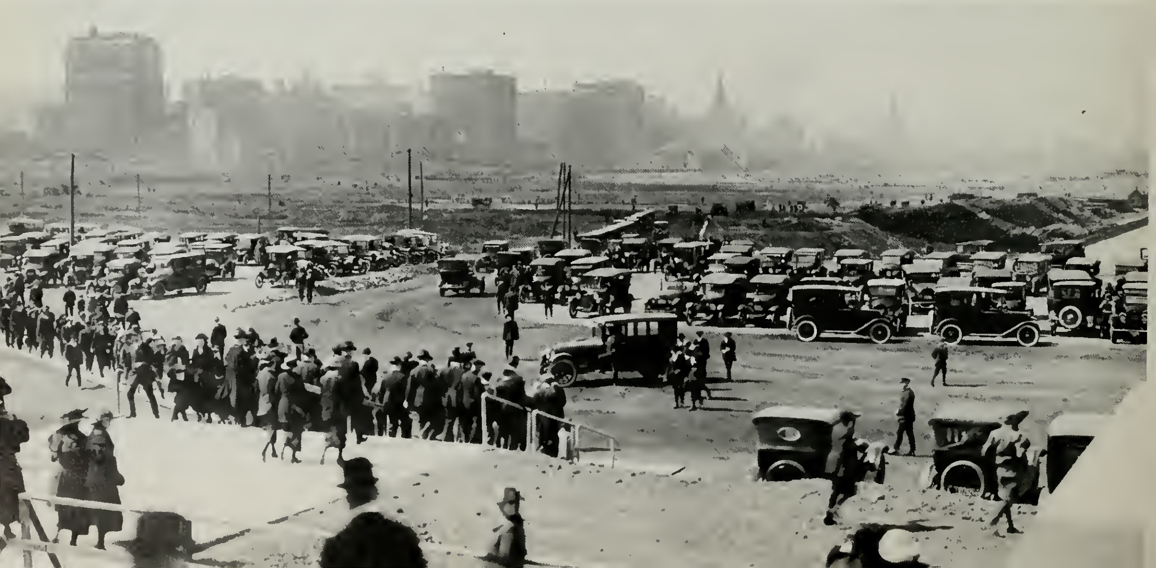
Viewed from atop the Blackstone Hotel, Field Museum dominates a dreary expanse of landfill. Photo probably made early in 1921.

1921: Field Museum's New Home

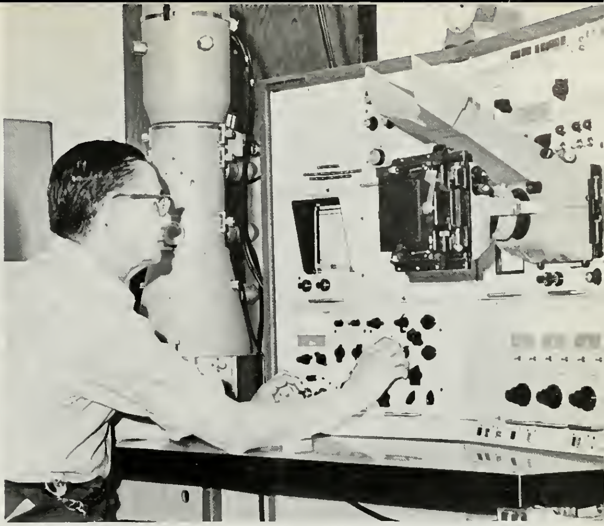
Fifty-six years ago, in March 1920, began the enormous task of moving Field Museum's collections from the old building in Jackson Park to the new building in Grant Park. During the next six months 354 loads of specimens and equipment were transported by truck. Transfer by rail began on April 26 and lasted for six weeks. During that time 321 boxcar loads were transferred. Nearly a year later, on May 2, 1921, the new building formally opened

More than a decade before, negotiations were completed for acquisition of the land site (earlier attempts to secure a more central location in the park fell through). In 1914, Frederick J.V. Skiff, then director, reported that the greater part of the steel required for the new building had been produced and more than one half of the necessary marble had been quarried and cut. On September 28, 1917, the cornerstone was laid. February 23, 1920, marked the closing date for the Jackson Park building, as exhibits had been substantially withdrawn for packing. Fifteen months

View from the Museum's north portico on opening day, May 2, 1921. The event attracted 8,000 visitors. Chicago's skyline, in the background, is dominated by two still-familiar landmarks: the Wrigley Building (right) and the Blackstone Hotel (left).



New Department of Exhibition area.



Fred Huysman, Field Museum scanning electron microscope technician and photographer, operates the new SEM. While the microscope itself was purchased by means of a National Science Foundation grant, all the housing for the unit, as well as humidity and temperature controls, were provided by Capital Campaign Funds.

-1976: Rehabilitation in Full Swing

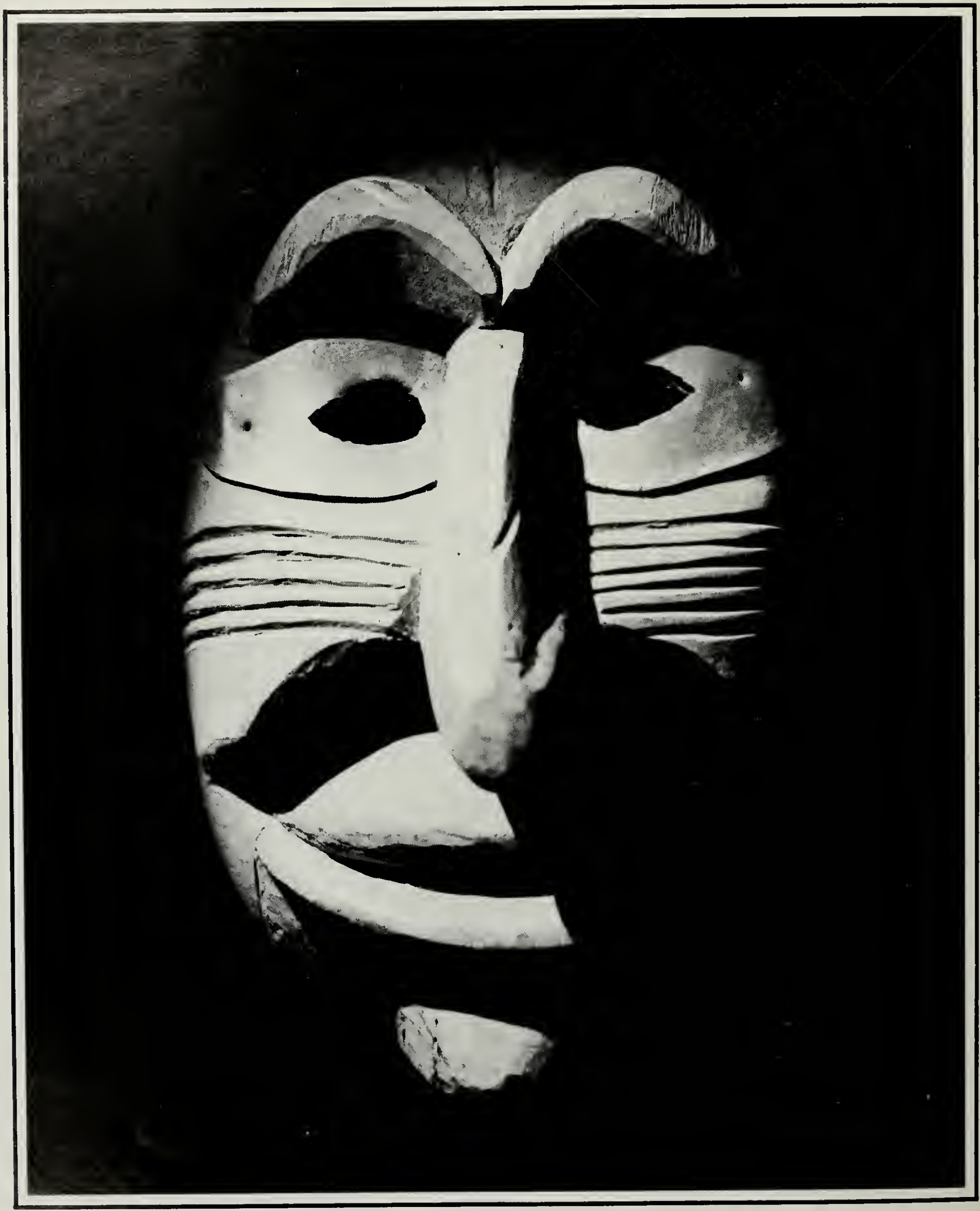
were to elapse before the formal reopening at the new location.

The building that visitors saw on that May afternoon, 55 years ago, remained essentially unchanged until the current rehabilitation program, which was initiated in 1971. Approximately 75 percent of that $25 million program has now been completed or is underway. Estimated completion date of the major portion is August of next year.

The final result will be a greatly updated museum, conforming to modern principles of public safety, fire prevention, and efficiency. The Museum will be barrier-free so that handicapped persons, too, may have an enjoyable and unhindered visit. More persons will be able to take advantage of the Museum's programs of general education; more school groups will be accommodated through new classrooms and service facilities, staff and visiting scientists will be able to conduct basic research in laboratories with modern, efficient equipment.

The new west parking lot nears completion. It will provide a turn-around area for buses. The new west entrance is being modified and lowered to ground level to make the Museum barrier-free for the handicapped.

Chief Engineer Leonard Carrion (right) inspects one of two new centrifugal compressors, or "chillers." These units are the core of an environmental control system that will maintain proper temperature and humidity levels in the Museum.



Iroquois Prayer: Intention and Anticipation

By David Blanchard

From 1689 to 1763 three great imperial powers struggled for domination over northeastern North America. These were the English, the French, and the Iroquois Confederacy of Five Nations. The English and the Iroquois joined forces early to eliminate the French from the northeast. Their efforts were successful and by the close of the "French and Indian Wars" French imperial presence in North America was virtually eliminated. The English gained control of all of Quebec and the Maritime provinces, establishing themselves as the dominant European power in North America. For their part, the Iroquois became the undisputed masters of the eastern Great Lakes fur trade. And finally, Iroquois ambition for supremacy over the west became enhanced by the English setting of the "Proclamation Line" which limited colonial expansion westward.

During the American War for Independence the Iroquois Confederacy split its allegiance, with most of the Iroquois Nations supporting the English. With the subsequent defeat of the English, Iroquois supremacy in the northeast came to an end. On George Washington's orders, General Sullivan marched through present-day upstate New York and laid havoc to Iroquoia. Sullivan's army set a pattern which was to typify the new republic's dealings with the native inhabitants of North America. Cultivated fields and homes were set to the torch and a large portion of the Iroquois population was slain. The survivors were forced to flee to Canada or else to settle on sparse reservations provided by the new government. Despite these serious setbacks, the Iroquois people were able to retain some of the political and social institutions which characterized the League at the height of its power.

It is for their political and social organization that the Iroquois are best known. The League of the Five Nations was a working, viable democracy which impressed American patriots attempting to effect a similar union of the fledgling colonies. Benjamin Franklin commented on the League in a 1751 letter to James Parker. Franklin noted the Iroquois' capability for "forming a Scheme for such a Union and being able to execute it in such a manner, as it had subsisted Ages, and appears indissoluble."[1]

The Iroquois also had, and have today, a rich cultural and spiritual heritage. Their religious beliefs have been accurately recorded by Iroquois historians as have detailed accounts of ritual praying and other speech events. Iroquois prayer is the subject of the diorama soon to be constructed in Hall Five of Field Museum.

This diorama will depict a contemporary Iroquois kitchen with an Iroquois man offering prayer and tobacco to the spirit of False Face. It is intended, through this exhibit, to demonstrate the continuity of the ritual process of prayer in the context of technological and social change. In so doing, the diorama should help dispel the myth that Native American culture is strictly a phenomenon of the past, a myth which unfortunately so many museum exhibits unwittingly support.

Iroquois prayer can only be fully understood when studied in the context of cosmogenic mythology and the ritual event which accompanies the prayer. Cosmogenic mythology describes the origins of the world in such a way as to render the universe comprehensible to a people. In the case of the Iroquois it does much more than this. Cosmogenic myths also describe the contractual relationships which exist between the various spiritual forces responsible for creation and man.

Strictly speaking, the Iroquois do not have a concept of creation. An early American linguist, Daniel Brinton, comments on this fact in his survey of American Indian "literature." Brinton notes that

> *these people [the Iroquois] were indeed keen enough to perceive that there really was no creation in such an account. Dry land was wanting, but earth was there, though hidden by boundless waters. They spoke distinctly of the action of the muskrat in bringing it [earth] up to the surface as a formation only.*[2]

Brinton goes on to explain that when the early Jesuit fathers pressed the Iroquois for an explanation as to the ultimate origin of matter they were simply told that they were "talking only nonsense."

This "formation" of the earth came about when the "Earth Grasper Chief" exiled his young bride, "Fertile Earth," from the regions of the upper plane. As it happened, Fertile Earth had conceived while still a virgin and the mind of her husband was made jealous by the "crafty machinations of the White Dragon of the Fire Body." The Earth Grasper ordered the "Tree of the Standing Light" to be uprooted, and his young, unsuspecting wife thrown through the abyss.

Fertile Earth fell, and continued to fall until she was rescued by a flock of flying water fowl. These birds laid her down on the back of a great turtle, whose shell became the foundation of the earth. Fertile Earth walked over the carapace, gradually causing it to increase in size. Eventually she gave birth to a daughter, sometimes referred to in the mythology as Zephrys.

Zephrys also became parthenogeneti-

◄ *False Face mask, carved of wood, used in the False Face curing ceremony of the Iroquois. The mask represents as well as embodies the spirit of False Face. About 8 inches high. Cat. No. 92125.*

David Blanchard is a research assistant in the Native American Program at Field Museum and a graduate student at the University of Chicago.

cally pregnant. In the final stages of her pregnancy, her yet unborn twin sons began an argument as to the best way to leave their mother. One of the sons, called "Flint," took the lead and exited through his mother's armpit, killing her in the process. The second son, "Sapling," was blamed for the deed by his brother. Angered by the death of her daughter, Fertile Earth decided to punish Sapling by throwing him out into the forest.

At this point, the Earth Grasper Chief intervened on behalf of Sapling. He taught his grandson how to live off the land, and ordered him to prepare the earth for the coming of man. Sapling took this charge seriously and set out at once to make the earth productive and otherwise habitable. As might be expected, his jealous brother, Flint, tried to interfere. Sapling made the rivers run in order to facilitate travel and communication among men. Flint placed boulders and rocks in these rivers to make them impassable. Sapling ordered the game animals to provide food for man, and Flint captured these animals and attempted to imprison them in a great cave. After securing the release of the game, Sapling challenged his brother to an open show of force. A final contest was arranged, to be played out over a game of cherry pit dice. On the eve of this confrontation, Sapling called upon all of the universe to aid him in his struggle. The following day, Sapling proved victorious. Flint was then banished to the realm of the lower world. The world was now ready for habitation by man. Sapling formed the image of man out of red clay and breathed a part of his life into him. He then charged man with continuing the work of creation, ordering him to constantly recreate the world, making it anew.

One of the clearest examples of the contractual nature of Iroquois cosmogenic mythology is found in the episode which describes the confrontation between Sapling and the False Face. After having transformed the world, it is told, Sapling was going about from place to place looking over his work. He happened to come upon a long-haired man, False Face, who confronted Sapling and claimed to be responsible for all of his good works. Sapling challenged this imposter to a show of power. A contest was agreed upon. Whoever could make the mountain move was the recognized master of the earth. False Face took his turn first, and not surprisingly, proved unsuccessful. Sapling went next. But before issuing his command he asked False Face to turn his back. Sapling then moved the mountain up, directly behind the unsuspecting False Face. When False Face turned around, his face hit the side of the mountain and became badly contorted. False Face then recognized Sapling as his master and made the following agreement. If man would offer tobacco and prayer to him and refer to him as "grandfather," False Face in turn would aid man by curing him of disease. Sapling agreed to these terms.

Prayer, among the Iroquois, generally follows or is accompanied by a ritual act. Prayers to the spirit of False Face, for example, follow the ritual sacrifice of tobacco, the smoke of which carries the prayers up to the spirit. The text of the prayer recounts the act which immediately precedes it and then alludes to the original contractual bargain agreed upon in the cosmogenic myth. An example of such a prayer has been recorded by Arthur Parker, an Iroquois man who worked as an anthropologist for the New York State Museum during the second decade of this century. This prayer, or a variant of it, is still used by the False Face Company of Healers in their "Opening," or "Tobacco Throwing Ceremony," performed every year at the feast of Mid-Winter. It is not difficult to envision the ceremony, given only the text of the prayer to go on.

Now receive you this tobacco, you, Shagodiowengowa, the great false face.
Now it is that you have come to where your grandchildren are gathered.
Now you are taking the place of the great false faces who are wandering in the rocky valleys and mountains.
Now you are the ones who think much of this sacred tobacco.
Now we wish to make a request of you. So we always offer this sacred tobacco, when we ask anything of you.
We pray that you help us with your power.
You can go over all the earth.
In the center of the earth is a great pine tree and that is the place of your resting. It is there that you rub your rattle when you come to rest.
Now then this tree receives this tobacco.
We ask that you watch over us and exercise your power to protect us from anything harmful.
We hold in mind that you have done your duty in past times and we ask that you continue vigilant henceforth.
We use this tobacco when we ask favors of you for you are very fond of this tobacco.
Now your cane gets tobacco. The great pine tree to its top is your cane.
Now you, the husk faces, you get tobacco also.
You have been associated with the false faces in times past.
Now you receive tobacco for you have done your duty.
So it is finished.[3]

With the ritual sacrifice of tobacco an intention is fulfilled on the part of the Iroquois petitioner. That part of the contractual agreement which demands something of man is therefore completed. The prayer which accompanies the ritual act reviews the complete agreement and calls upon the spirit of False Face to fulfill his part of the bargain. A sense of anticipation is gradually built up as the petitioner recalls past instances when False Face did indeed respond to the prayer and granted man's request. This two-part structure of intention and anticipation is typical of Iroquois prayer.

Not all prayer is solely concerned with petition. Indeed, thanksgiving is a very important element in many Iroquois prayers. The prayers of the "Yotondak'o'," or "Opening Ceremony of the Pygmy Society," demonstrate this concern:

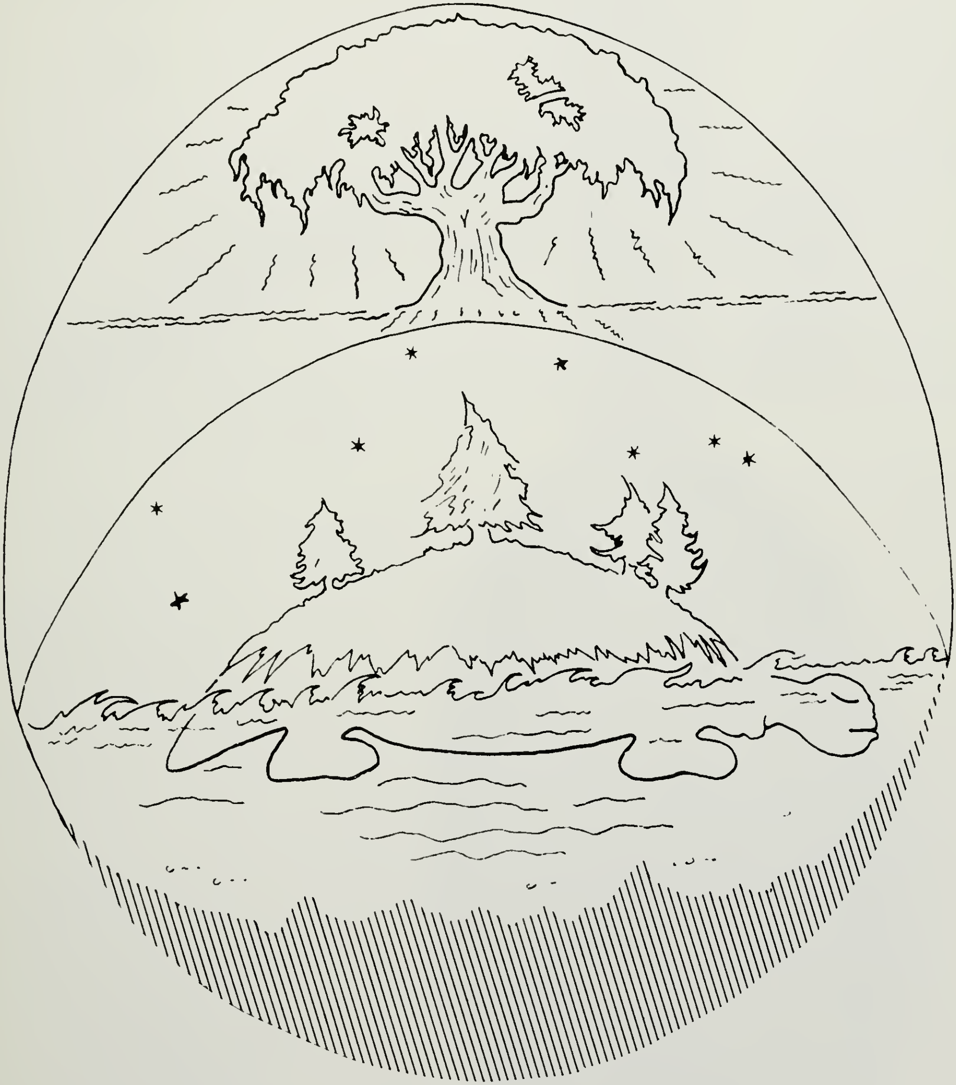
Now we commence to thank the Creator.
Now we are thankful that we who have assembled here are well.
We are thankful to the Creator for the world and all that is upon it for our benefit.
We thank the Sun and the Moon.
We thank the Creator that so far tonight we are all well.

At this point in the ritual, after thanksgiving has been offered, the principles of the ceremony are all introduced to the assembled community.

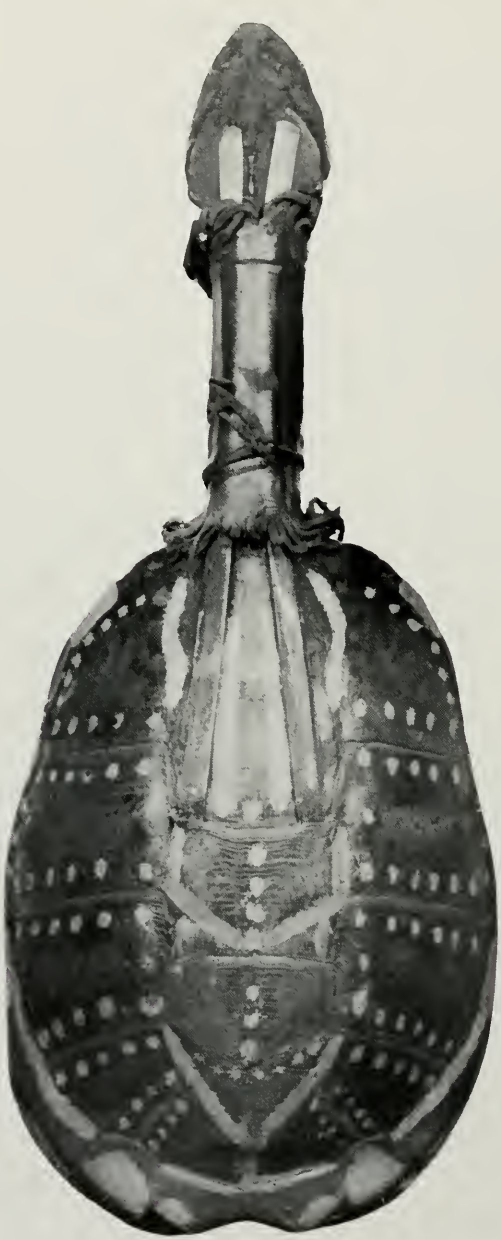
Now I announce that [sick man's name] *is to be treated.*
Now this one, [man's name] *will throw tobacco into the fire.*
Now these will lead the singing [singers are now named].
So have I said.

The "tobacco thrower" then advances to the fire and, seating himself, takes a basket of Indian tobacco and speaks as follows:

Now the smoke rises.
Receive you this incense.
You who run in the darkness.



Representation of Iroquoian cosmos. Above is the Tree of the Standing Light, below is the turtle whose shell became the foundation of the earth. Drawing by Stewart MacLeod, from J. N. Hewitt.



Rattle made from snapping turtle used in prayer ceremony by False Face Society. Length: 20¼ inches, Cat. No. 55762

Now the smoke rises.
Receive you this incense.
You who run in the darkness.
You know that this one has thought of you.
Now you are able to cause sickness.
Now, when first you saw that men-beings were upon the earth, you said,
"These are our grandchildren."
You promised to be one of the forces for men-beings' help, for thereby you would receive offerings of tobacco.
So now you get tobacco–you, the Pygmies. [He sprinkles tobacco on the fire.]
Now is the time when you have come;
You and the member have assembled here tonight.
Now again you receive tobacco–you the Pygmies.
You are the wanderers of the mountains;
You have promised to hear us whenever the drum sounds.
Even as far away as seven days' journey.
Now all of you receive tobacco.
You well know the members of this society.
So let this [sickness] cease.
You are the cause of a person, a member becoming ill.
Henceforth give good fortune for he has fulfilled his duty and has given you tobacco.
You love tobacco and we remember it;
So also you should remember us.
Now the drum receives tobacco.
And the rattle also.
It is our belief that we have said all,
So now we hope that you will help us.
Now these are the words spoken before you all.
You who are gathered here tonight.
So now it is done.[4]

Although the surface details of the Pygmy Society prayer differ from those of the False Face Society, the basic structure of intention and anticipation remains the same. In both cases there is an unstated understanding that the two beings, man and spirit, have an implicit agreement between themselves. Nothing extraordinary or out of the usual is asked for in either case, rather just what was agreed upon in mythological time. The spirit forces are referred to as "grandfather," a term of respect, and tobacco is burned in their honor. For their part, the spirit forces are asked to keep the society and its supporters free from disease and affliction. In short, this affective shift from intention to anticipation is realized in two ways: 1) by making the text of the prayer

Gourd rattles used by Pygmy Society. Right: 14½ inches long, Cat. No. 93102; left: 10½ inches long, Cat. No. 55769.

allude in some way to a primal contract, and 2) by accompanying the prayer with a formal ritual.

Another important aspect of prayer is that it is directed towards a spirit force. There are indeed other forms of Iroquois oral tradition which follow this pattern of reference and ritual, but are not prayers themselves. A clear example of such a form is the "Funeral Address of a Lord of the Confederacy." This address is found in Parker's work on the "Constitution of the Five Nations," itself a kind of contract which specifies relations and responsibilities between the people of the Five Nations:

> *Now we become reconciled as you start away. You were once a Lord of the Five Nations' Confederacy and the United People trusted you. Now we release you for it is true that it is no longer possible for us to walk about together on the earth. Now therefore we lay your body here. Here we lay it away. Now then we say to you, "Persevere onwards to the place where the Creator dwells in peace. Let not the things of the earth hinder you. Let nothing that transpired while yet you lived hinder you. In hunting you once took delight; in the game of LaCrosse you once took delight and in the feasts and pleasant occasions your mind was amused, but now do not allow thoughts of these things to give you trouble. Let not your relatives hinder you and also let not your friends and associates trouble your mind. Regard none of these things."*
>
> *Now then, in turn, you here present who were related to this man and you who were his friends and associates, behold the path that is yours also. Soon we also will be in his place. For this reason hold yourselves in restraint as you go from place to place. In your actions and in your conversation do no idle thing. Speak not idle talk neither gossip. Be careful of this and speak not and do not give way to evil behavior. One year is the time that you must abstain from unseemly levity but if you cannot do this for ceremony, ten days is the time to regard these things for respect.*[5]

Like prayer, the funeral address accompanies a ritual act, in this case the burial of the body. Like prayer also, the funeral address alludes to a contractual agreement, the "Great Binding Law," which serves as a foundation of Iroquois society. However, while the form of the address has a structural similarity to Iroquois prayer, it has a different affect upon the community. This is so because the address is politically and socially motivated, while prayer is spiritually charged. Thus, these affective differences correspond to the difference of intention between these two speech events.

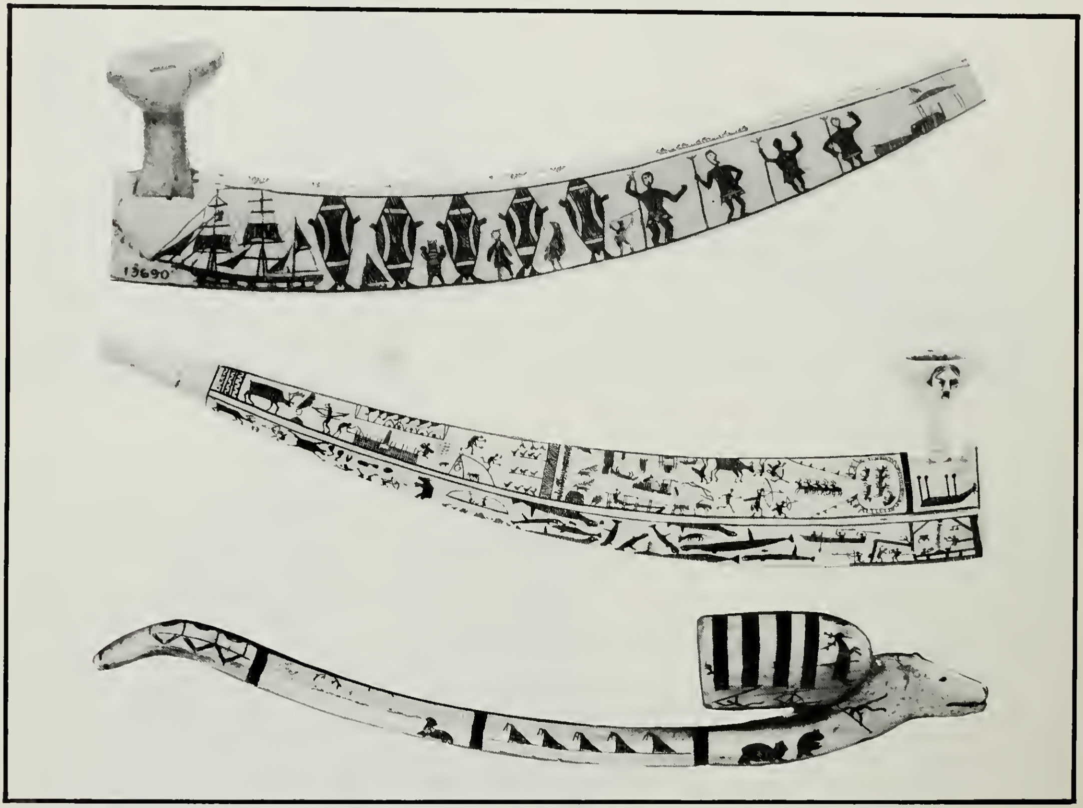
This brief examination of Iroquois prayer leads to a number of interesting conclusions. On the one hand, it is possible to learn a great deal about the Iroquois and their conceptions of the universe through an analysis of their prayer. It becomes immediately evident, for example, that the Iroquois consider themselves as partners to the spiritual forces of nature in the ongoing process of creation. They have isolated and symbolized some of their implicit obligations in this respect in their prayer.

Secondly it becomes evident to the student of folklore and anthropology that any analysis of prayer text which precludes a study of the ritual and cosmogenic context of such a text is a futile endeavor. All too often Western scholars have attempted to impose their own genres and categories onto an experience which is altogether foreign to them. Perhaps a more useful approach would be to study prayer, and indeed all oral tradition within its intentional and otherwise affective existential context.

NOTES

1. Larabee et al.; *The Papers of Benjamin Franklin*, IV, New Haven, Conn., 1961. p. 117.
2. Brinton, Daniel; *Aboriginal American Authors and Their Productions*. Philadelphia, 1883, p. 67.
3. Parker, Arthur; "The Code of Handsome Lake," in *Parker on the Iroquois*, William Fenton, editor. Syracuse, 1969, pp. 120-121.
4. Ibid., pp. 128-29.
5. Parker, Arthur; "The Constitution of the Five Nations," in *Parker on the Iroquois*, William Fenton, editor. Syracuse, 1969, p. 58.

field briefs



Alaskan Eskimo pipes recently stolen from Field Museum. Top to bottom: Cat. No. 13690, length about 8 inches; no catalogue number, length 12 inches; Cat. No. 13700, length about 8 inches.

Eskimo Pipes Stolen

Shown above are three Eskimo pipes stolen from Field Museum on or about February 5, 1976. They were on display in the temporary exhibition, "19th Century Alaskan Eskimo Art." The rare pipes are from western Alaska and are carved from walrus ivory.

Anyone with information on the whereabouts of these pipes is asked to contact the director, Field Museum of Natural History. The phone number is (312) 922-9410. A reward is offered for their return.

Plan Now for Members' Nights!

May 6 and 7

Members: plan now to attend Field Museum's gala annual event, Members' Night, on either Thursday, May 6, or Friday, May 7, from 6 to 10 p.m. It is the one opportunity that you, your family, and guests have each year to go "behind the scenes"–to visit the laboratories, preparation rooms, and see other areas of the Museum's vast collections. Staff members will be on hand to escort you, answer questions, and demonstrate many of the interesting techniques used by curators and preparators. Among the exciting features this year will be a first showing of a 55-foot model of the pterosaur, a prehistoric flying reptile.

Refreshments will be served in Stanley Field Hall. On the ground floor, the Museum cafeteria will be open for dining 6 to 8 p.m. Free parking will be available and free, round-trip charter busses will run every 30 minutes from the Loop to the Museum from 6 until Museum closing. Further details will appear in a special mailing for members and in next month's Bulletin.

SCANNING ELECTRON MICROSCOPY

SUMMER WORKSHOP

July 12 - August 6

Upper-level high school students and freshmen or sophomore college students will have the unusual opportunity to study the scanning electron microscope and its operation first-hand, during a four-week workshop this summer at Field Museum. They will spend one month working with staff scientists, during which they will learn the basics of scanning microscope theory and operation, specimen preparation techniques, and participate in biological or geological research.

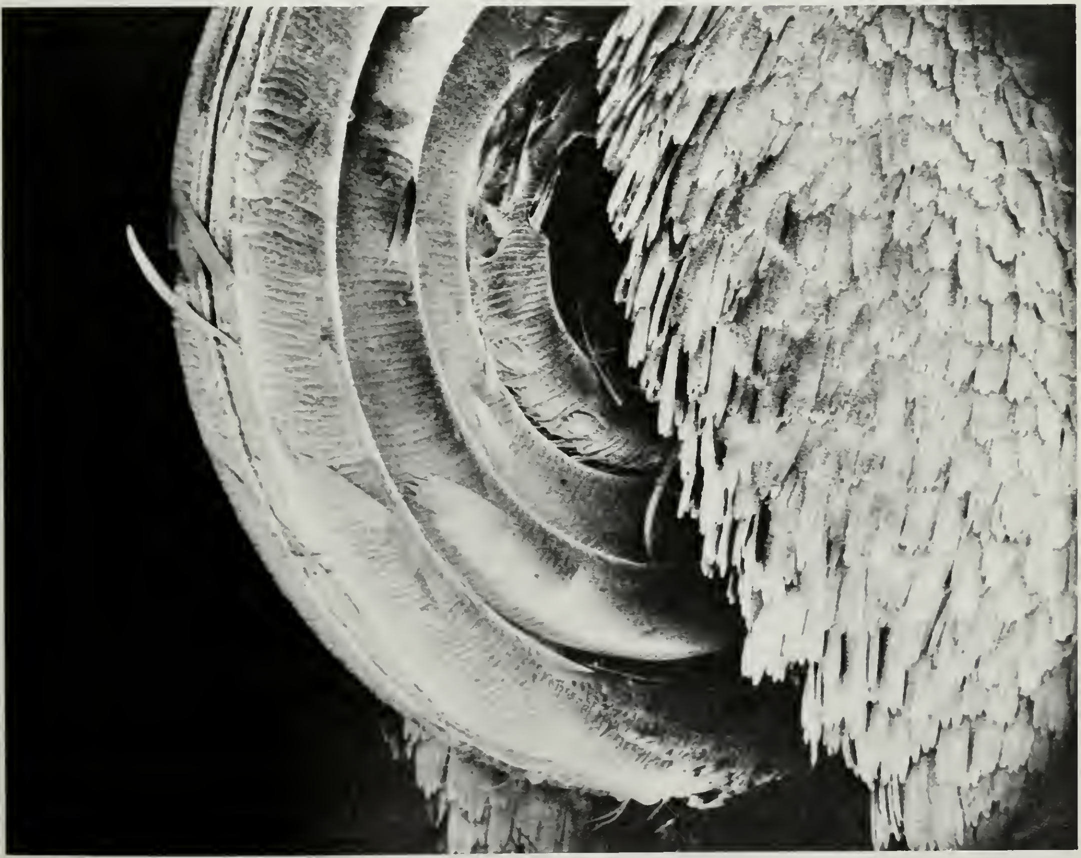
Each student will: 1) prepare materials for study, 2) spend three half-days at the scanning microscope making observations and photographs with the SEM technician, and 3) work with a Museum scientist in interpreting results of his studies.

The areas of research in which a student may specialize are: flowering plants, liverworts, insects, mollusks, mammals, and Tertiary invertebrate fossils.

Enrollment for the workshop is limited to eight students; the fee is $125.

Applications must be in by May 17, and should consist of a letter, stating the applicant's area of interest and background and include a letter of recommendation from a science teacher. The application should be sent to: Phil Hanson, Department of Education, Field Museum of Natural History; Roosevelt Road at Lake Shore Drive; Chicago, Ill. 60605.

View through scanning electron microscope: head of moth, showing scales and coiled proboscis.



Weekend Field Trip for Geology Buffs

Devil's Lake

By popular demand, Field Museum's unique "lecture tour" of Wisconsin's Baraboo Range will be repeated in May. The weekend field trip will leave the Museum at 8:00 a.m. Saturday, May 15, and return Sunday, May 16, at about 7:00 p.m.

Dr. Edward Olsen, curator of mineralogy, will conduct the geology field trip through the range and along the shores and hinterland of beautiful Devil's Lake.

The Baraboo Range is of special interest as a *monadnock*—what is left of an ancient mountain range and which now stands out above the younger rocks and sediments. The range consists of quartzite—more than one billion years old—which, although compressed in places into vertical folds, retains the original sedimentary structures. The mountains were further modified by glaciers, forming the lake and the picturesque glens, and changing the course of rivers.

The cost of this educational weekend is $50.00 per person, and includes all expenses of transportation on a charter bus and overnight accommodations in a first class resort motel. (Price is based on double occupancy, with twin beds. An extra fee will be charged for single facilities.) The fee also includes all meals and gratuities, except personal extras such as alcoholic beverages and special food service. Saturday evening will be free for you to enjoy the motel's recreational facilities.

Hiking clothes are strongly recommended for the scheduled hikes. The trip is not suitable for children, but young people interested in natural history are welcome. The trip is limited to 30 persons, so get your reservation in early!

For further details write or call Dorothy Roder, Field Museum 922-9410, ext 219.

Field Museum Geology Field Trip

May 15-16, 1976

I wish ______ reservations for the Baraboo Range Field Trip.
(how many)
Name ______
Address ______
City ______ State ______ Zip ______
Telephone: ______
Amount enclosed ______
(make checks payable to Field Museum)

Return this coupon (or facsimile) today!

SECOND ANNUAL WILDERNESS CANOE TRIP

July 18-28

Applications are now open for a July canoe trip through Ontario's Quetico Provincial Park, a membership benefit cosponsored by Field Museum and the Voyageur Wilderness program of Atikokan, Ontario.

The Quetico, just north of Superior National Forest, in Minnesota, is one of the continent's last remaining wilderness areas. Transportation in this land of rock, pines, and glacial lakes is by muscle power only. To enjoy the unspoiled beauty of Quetico, one must earn his way in—by paddling a canoe and by carrying the canoe and gear over portage trails, which may be from a few yards to a mile long.

The group, limited to thirty persons, will spend eight days and seven nights canoeing and camping—not fighting nature, but learning to live with it. All equipment, food, and guide services, as well as bus transportation between Field Museum and the Quetico, are included in the package. The trip is limited to Museum members 15 through 19 years old who are able to swim. Applicants will be interviewed by trip leaders, who will then select the final group.

Dates: July 18 through July 28, 1976
Total Cost: $195.00
Deadline for Application: May 15
Notification of Participants: By June 1

A slide presentation by representatives of the Voyageur Wilderness Program will be given on Members' Nights, May 6 and 7. Viewing times and room location will appear in Members' Night guide. For applications and further information, please write:

Quetico Canoe Trip
Field Museum of Natural History
Roosevelt Road at Lake Shore Drive
Chicago, Ill. 60605

APRIL at Field Museum

New Programs

ILLUSTRATED LECTURE SERIES

"Focus: People in the Mainstream." Illustrated lecture series in conjunction with the *Man in His Environment* exhibit (see below). Presented by people actively involved in some aspect of the environment. Fridays at 7:30 p.m.; repeated on Saturdays at 2:30 p.m. Ground floor lecture hall.

April 2, 3:	*The Sky Wolf*, by film producers/explorers Cheryl and Neil Rettig.
April 9, 10:	*Waste Not, Want Not: Sewage Recycling and the Deep Tunnel Project*, by Metropolitan Sanitary District Commissioner Joanne H. Alter.
April 16, 17:	*Building, People, and the Urban Environment*, by professor of history, art history, and urban affairs Carl W. Condit.
April 23, 24:	*The Zoo and the Modern World*, by Chicago Zoological Park Director George Rabb.
April 30, May 1:	*The Man-Built Environment*, by Metropolitan Sanitary District urban planner David Bielenberg.

ENVIRONMENT FILM SERIES

"Environment: The Sum of its Parts." The best and newest environmental films are offered in conjunction with the *Man in His Environment* exhibit (see below). The April theme is "Ecosystems: Films Dealing With a Variety of Natural Communities." Films are shown at 11:00 a.m. and 1:00 p.m. in the Meeting Room, second floor north.

April 2, 3, 4:	*Mzima: Portrait of a Spring* (53 min.)
April 9, 10, 11:	*The Salt Marsh: A Question of Values* (22 min.) *Ecology: Olympic Rain Forest* (20 min.)
April 16, 17, 18:	*The Sea* (26 min.)
April 23, 24, 25:	*Survival on The Prairie* (54 min.)
April 30, May 1, 2:	*The Great Barrier Reef* (54 min.)

MUSEUM TOURS

Highlight Tours conducted by museum education staff and volunteers on April 14, 19, 21 and 23 at 2:00 p.m. Meet at the information booth.

Special Exhibits

BICENTENNIAL EXHIBIT

"Man in His Environment." The most talked-about environmental exhibit in the country deals with natural systems and man's impact on them—and leads to an inescapable conclusion: that man is not the independent master he assumes himself to be, but one of earth's creatures, as dependent upon the environment as any other creature. *Man in His Environment* takes a global view of the most serious problems now confronting all mankind and asks visitors to involve themselves in decisions that have to be made.

ESKIMO ART EXHIBIT

"19th Century Alaskan Eskimo Art." In the early to mid-19th century, traditional Alaskan Eskimo carving on ivory and wood reached special peaks of development. Art was inseparable from Eskimo life; the most commonplace articles were fashioned and decorated in aesthetically beautiful ways. But the 1890s brought European and American gold prospectors swarming to Alaska and Eskimo artists began producing a new art on demand: souvenirs. Come and compare the new with the traditional in this handsome exhibit.

Public tours of the exhibit are offered every Tuesday at 11:00 a.m. and 1:00 p.m. Meet at exhibit entrance, Hall 27.

Continuing Programs

ESKIMO FILM PROGRAM

Contemporary Canadian Eskimo Art and Artists are illustrated in three films which can be seen daily at 12:00 noon. For location, inquire at entrances.

Eskimo in Life and Legend (23 min.) The story of a great hunter, who carved the image of his wish from a chosen piece of stone—and saw the wish come true.

Eskimo Artist Kenojuak (19 min.) Kenojuak, artist, wife, and mother, makes her drawings when she is free of the duties of trail or camp. Her thoughts are spoken as commentary for the film and add to our understanding of the images she creates.

Kalvak (20 min.) As a child, Kalvak, now a sixty-eight-year-old Eskimo woman, traveled on many long hunting trips with her parents. She uses the subjects of these experiences which give her beautiful and sensitive drawings a strong environmental emphasis.

SATURDAY DISCOVERY PROGRAM

Tours, Demonstrations, and Participatory Activities are offered every Saturday, 11:00 a.m. to 3:00 p m. Topics vary, but often include:

Endangered Animals—A half-hour tour focusing on animal species in danger of extinction

Tibet—Magic and mystery in the culture of Tibet

Ancient Egypt—A half-hour tour through the Egyptian collection which includes an explanation of the "why's" and "how's" of mummy-making

Other Discovery activities may include: (1) making a clay dinosaur, in the Hall of Dinosaurs, to take home; (2) learning how animals are prepared for museum exhibits; (3) examining the role of the environment in influencing patterns of Eskimo life; and (4) a tour that traces major trends in the physical and cultural evolution of man.

For specific times for each of the above events, phone the museum, or inquire on arrival at museum entrances.

SPRING JOURNEY FOR CHILDREN

"Eskimo Hunters." A free self-guided tour through Eskimo-related halls, including a "hunt" through the museum's newest exhibit, *19th Century Alaskan Eskimo Art.* Colorful tour sheets provide questions about exhibits as well as space for making drawings which often help children interpret the exhibits they see. All children who can read and write are invited to participate. Journey sheets in English and Spanish are available at the information booth. Bring pen or pencil.

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WEAVING DEMONSTRATIONS

The Ancient Art of Weaving. Demonstrations by members of the North Shore Weavers' Guild on a two-harness, handcrafted Mexican floor loom, every Monday, Wednesday, and Friday, 10:30-11:30 a m. and 12:00-1:00 p.m. On Mondays, April 5 and 19, the demonstrations include spinning. South Lounge, second floor.

Special Interest Meetings Open to the Public

April 2, 8:00 p.m	**Chicago Anthropological Society** (meets first Friday of each month)
April 6, 7:30 p.m.	**Kennicott Club** (meets first Tuesday of each month)
April 8, 8:00 p.m.	**Chicago Mountaineering Club**
April 11, 2:00 p.m.	**Chicago Shell Club**
April 13, 7:30 p.m.	**Chicago Nature Camera Club**
8:00 p.m.	**Chicagoland Glider Council**
April 14, 7:00 p.m.	**Chicago Ornithological Society**
7:30 p.m.	**Windy City Grotto, National Speleological Society**
April 20, 7:30 p.m.	**Chicago Audubon Society**

Coming in May

Members Nights; May 6 & 7, 1976. The annual open house for museum members of all ages features special programs and behind-the-scenes activities in the scientific, education, and exhibition departments from 6:00 to 10:00 p.m.

Adult and Family Field Trips. Now in its sixth season, Field Museum's Environmental Education Program has given thousands of Chicago area residents the opportunity to explore the varied environments of northern Illinois and Indiana under the leadership of experienced field scientists. For field trip information, write: Ray A Kroc Environmental Education Program, Field Trips, Field Museum of Natural History.

April Hours

THE MUSEUM opens daily at 9:00 a m and closes at 5:00 p.m. every day except Friday. On Friday, year-round, the museum is open to 9:00 p m Food service areas are open weekdays 11:00 a m to 3:00 p m., Saturday and Sunday to 4:00 p m

THE MUSEUM LIBRARY is open 9:00 a.m to 4:00 p m . Monday through Friday. (closed April 16). Please obtain pass at reception desk, first floor north

MUSEUM TELEPHONE: 922-9410

May
1976

Field Museum of Natural History Bulletin

Members' Nights
May 6 and 7

**Field Museum
of Natural History
Bulletin**

May, 1976
Vol. 47, No. 5

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Production: Oscar Anderson
Calendar: Nika Semkoff
Staff photographer: Ron Testa

Field Museum of Natural History
Founded 1893

Director: E. Leland Webber

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CONTENTS

3 EARLY CHICAGOLAND
By Philip Hanson

8 EXHIBIT OF WHALE PICTURES AND POEMS

9 MEMBERS' NIGHTS, MAY 6 and 7

12 THE PAWNEE EARTH LODGE
Preview of a Major Forthcoming Exhibit
By John White

14 PTEROSAUR
By John Bolt

18 BOOKS

19 MAY AT FIELD MUSEUM
Calendar of coming events

COVER PHOTO

Two views of a life-size skeleton model of *Rhamphorhynchus*, a pterosaur (or pterodactyl) with wingspan of 30 inches, from the Upper Jurassic of Germany. The model was cast in epoxy by Peter Wellnhofer of the Bavarian State Museum for Paleontology and Historical Geology and prepared for the Carnegie Museum. This model, in addition to actual pterosaur fossils, is on view in a special, temporary exhibit at Field Museum. Photo by Fred Huysmans. For more on Pterosaurs see page 14.

PHOTO AND ART CREDITS

Cover: Fred Huysmans; page 3: Chicago Historical Society; 4: U.S. Geological Survey; 5 (top and bottom): Chicago Historical Society; 6: Field Museum; 7: Chicago Historical Society; 8: © 1975 The Scrimshaw Press; 9-11 Field Museum staff photos; 12, 13: Stewart MacLeod; 14-15: Field Museum staff photos; 16: Pat Brew; 17: Field Museum staff photo.

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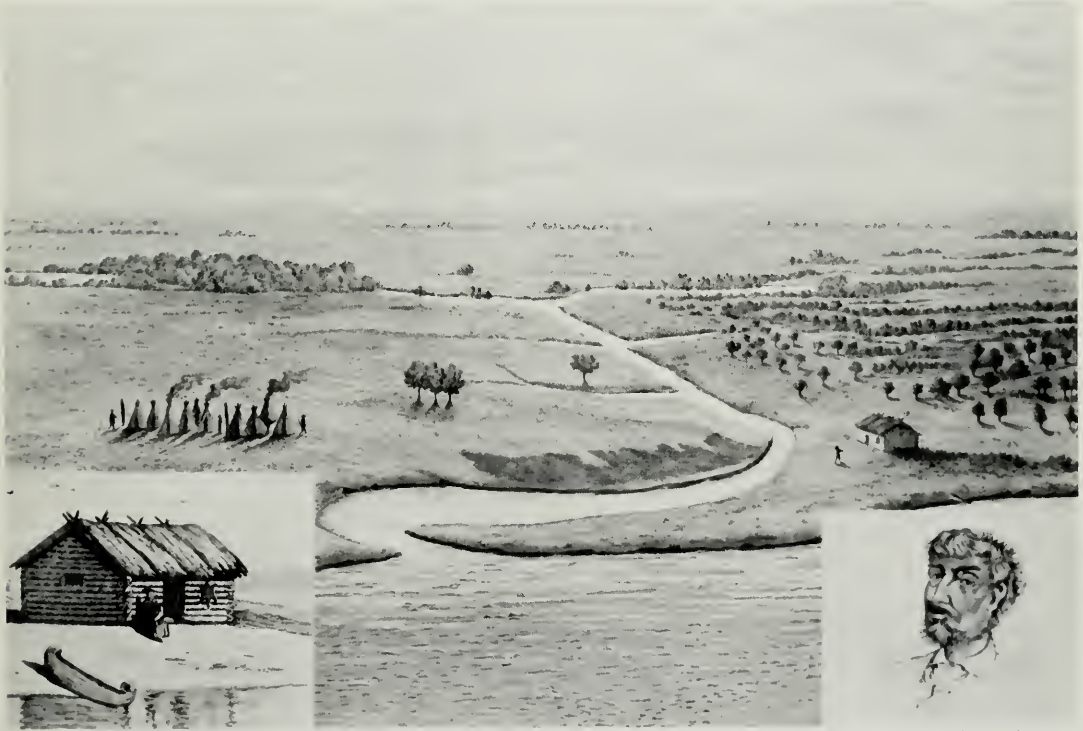
Early Chicagoland

Before the metropolis there was wind-blown prairie fringed with forest

by Philip Hanson



Aquatint of the Chicago area in 1779, showing the cabin of Jean Baptiste Point De Saible, the "first permanent" settler, by Raoul Varin. Published by A. Ackermann and Sons, Paris, France, 1930.

Morning calm and bright, and we, in our holiday attire, with flags flying, completed the last twelve miles of our lake voyage. Arriving at Douglas Grove, where the prairie could be seen through the oak woods, I landed, and climbing a tree, gazed in admiration on the first prairie I had ever seen. The waving grass, intermingling with a rich profusion of wild flowers, was the most beautiful sight I had ever gazed upon. In the distance the grove of Blue Island loomed up, beyond it the timbers on the Desplaines River, while to give animation to the scene, a herd of wild deer appeared, and a pair of red foxes emerged from the grass within gunshot of me. Looking north, I saw the white-washed buildings of Fort Dearborn sparkling in the sunshine, our boats with flags flying, and oars keeping time to the cheering boat song. I was spell-bound and

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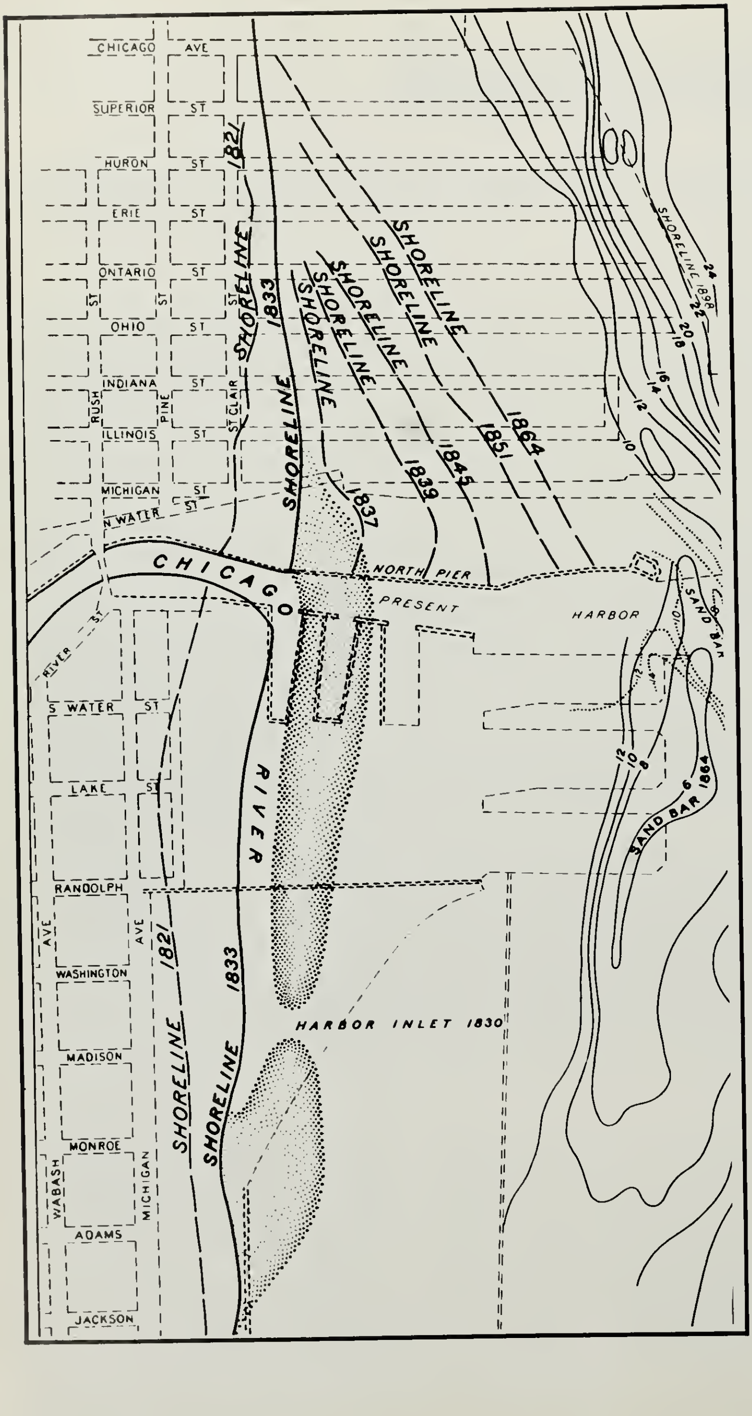
Philip Hanson is a researcher/assistant for the Department of Education.


CHICAGO AVE
SUPERIOR ST
HURON ST
ERIE ST
ONTARIO ST
OHIO ST
INDIANA ST
ILLINOIS ST
MICHIGAN ST
N WATER ST
RUSH ST
PINE ST
ST CLAIR ST
SHORELINE 1821
SHORELINE 1833
SHORELINE 1837
SHORELINE 1839
SHORELINE 1845
SHORELINE 1851
SHORELINE 1864
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CHICAGO
NORTH PIER
PRESENT
HARBOR
SAND BAR
RIVER
S WATER ST
LAKE ST
RANDOLPH
WASHINGTON
MADISON
MONROE
ADAMS
JACKSON
WABASH AVE
MICHIGAN AVE
12
10
8
6
SAND BAR 1864
RIVER
HARBOR INLET 1830
SHORELINE 1821
SHORELINE 1833

◄ *Chicago shoreline changes, From 1902 U.S. Geological Survey map.*

amazed at the beautiful scene before me.[1]

This is how the Chicago area appeared to Gurdon S. Hubbard in 1818, from his vantage point near Lake Michigan about three miles south of what is now the Loop. It is not easy, now, to imagine that such a scene ever existed. The buildings, streets, and other man-made structures are accepted as part of the natural scene, and our memory cannot reach back to the time they were not here. What was here, a century and a half ago, was a remarkably beautiful landscape. But thanks to the written accounts of early settlers and visitors, we are able to visualize how the area looked at that time, before it gave way to the advancing frontier and to "progress."

The earliest accounts of the Chicago area were written down by the French Jesuit missionary Jacques Marquette who, with Louis Jolliet, first passed through the region in 1673. What attracted them was a convenient portage between the Des Plaines River—which led ultimately into the Mississippi—and the Chicago River, which emptied into Lake Michigan.

A year later, Marquette returned to the Chicago area, where ill health and bad weather forced his small band to hold up for the winter. While Marquette's account does not provide vivid descriptions, it does leave some hints as to the general appearance of the area. His camp, in a small oak grove straddling the river, was about three miles southwest of what is now downtown Chicago, on the south branch of the Chicago River. Today it is within the neighborhood of Bridgeport. During the course of their four-month stay, Marquette's group killed four deer, several prairie chickens, and three buffalo. Today, deer are still seen occasionally in the forest preserves skirting the city, while prairie chickens are only to be found in small preserves many miles away; wild buffalo have not been seen in Illinois, let alone Chicago, since the early nineteenth century.

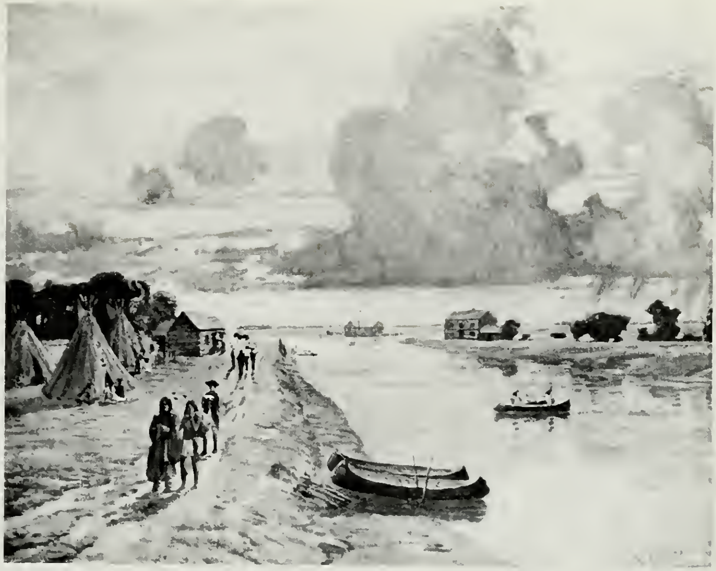
Following the Jolliet-Marquette visits, there is a time gap in descriptions of the Chicago area. Explorers, missionaries, and traders, such as Robert La Salle and Henri de Tonty, continued to use the Chicago portage, but few others bothered to record their observations. Little more was written about the region until the early 1800s.

In 1795 the federal government acquired a piece of land six miles square at the mouth of the Chicago River, and eight years later began the construction of Fort Dearborn near the river mouth. The stage was now set for the influx of settlers.

By 1816 the federal government had acquired most of the land that was to make up the future metropolis. This was a twenty-mile-wide strip running southwest from Lake Michigan, where its midline coincided with the Chicago River's outlet. The parcel was bordered on the north and south by Indian boundary lines; outside this corridor the land was still held by the Potowatami, Ottawa, and Chippewa Indians.

Before any land within the corridor could be privately purchased, it first had to be surveyed. Government surveyors marked off the land into six-mile-square parcels, called townships. These, in turn, were subdivided into thirty-six sections, each one mile square. Today almost all of Chicago's main thoroughfares lie along these section boundaries. The field notes of the men who made the original survey comprise our most accurate record of what the Chicago area was like in a virgin state. Notes accompanying the maps told what kinds of vegetation could be found at any point, and prospective buyers used the maps to locate sites that were adequately drained or which were near stands of timber that could be used for lumber or fuel.

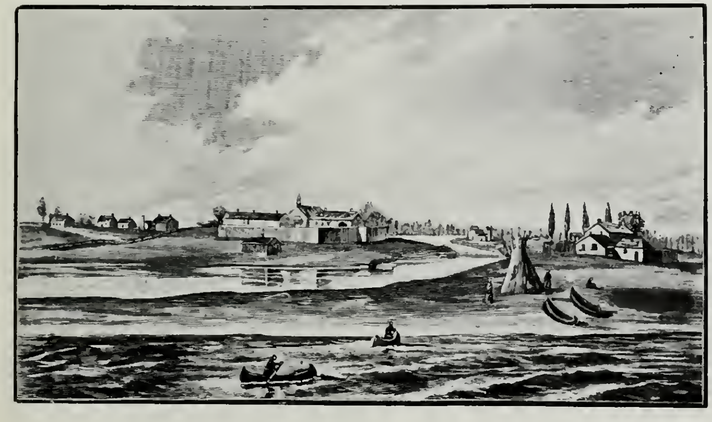
The reports of early travellers give us a general overview of the landscape. Colbee Benton, who journeyed to Chicago from the Indiana shores in 1833, paused long enough to record this impression of the countryside:



Oil painting, Chicago in 1831; *artist unknown.*

. . . The country about Chicago, for the distance of twelve miles from the lake, is mostly a low prairie covered with grass and beautiful flowers. Southwest from the town there is not one tree to be seen; the horizon rests upon the prairie. North, on the lake, is sandy hills and barren. Between there and the north branch is a swampy, marshy place, and there is a marshy place on the south branch. The town stands on the highest part of the prairie, and in the wet part of the season the water is so deep that it is necessary to wade from the town for some miles to gain the dry prairie.[2]

Engraving, Chicago in 1830, from the Lake, *from* History of Chicago, *Vol. 1, p. 164, by A. T. Andreas, Chicago, 1884.*



An 1821 map reveals that most of the Chicago area was then covered by prairie. From the lakeshore to about twelve miles inland the land is extremely flat. Before it was drained by ditches, sewers, and roadside culverts the area remained wet for a good part of the year. It was across this prairie that travellers to other parts of Illinois would pass. Their horses and carriages would be nearly hidden by the prairie cordgrass and big bluestem grass, while their narrow-wheeled vehicles sank to the axles in the soft prairie sod. An account of a ride across this prairie between what is now the suburb of Riverside and the Chicago Loop suggests what the prairie was like in 1836:

> *We were detained a shorter time at the ferry (across the Des Plaines River) and reached the belt of trees at the edge of the Nine-mile Prairie, before sunset. Here, in common prudence, we ought to have stopped till the next day, even if no other accommodations could be afforded us than a roof over our heads. We deserved an ague for crossing the swamp after dark, in an open wagon, at a foot*

> *pace. Nobody was aware of this in time, and we set forward; the feet of our wearied horses plashing in water at every step of the nine miles. There was no road; and we had to trust the instinct of the driver and horses to keep us in the right direction.... The driver bade us to look to our right hand. A black bear was trotting alongside of us, at a little distance. After keeping up his trot for sometime, he turned off from our track....*[3]

A prominent feature on the 1821 map is the Chicago Portage—a tenuous connection between the south branch of the Chicago River and the marshy area leading to the larger river system to the southwest. The south branch of the Chicago River ended somewhere near what is now 27th Street and Western Avenue. About a mile west, near 31st Street and Kedzie Avenue, began a low, marshy area known as Mud Lake; between was the Chicago Portage. In wet seasons boats had to be carried overland only 200 feet or so, but in dry seasons they were portaged for many miles before reaching water deep enough to float. Even at that, the route provided a remarkably short avenue between the upper Great Lakes and the Mississippi valley. The journey was not easy. Gurdon Hubbard, travelling this route through Mud Lake in 1818, gives a graphic account:

> *The mud was very deep, and along the edge of the lake grew tall grass and wild rice, often reaching above a man's head, and so strong and dense it was almost impossible to walk through them.... Only at rare intervals was there sufficient water to float a boat.... Four men only remained in a boat and pushed with these poles, while six or eight others waded in mud alongside,... Those who waded through the mud frequently sank to their waist, and at times were forced to cling to the side of the boat to prevent going over their heads; after reaching the end and camping for the night came the task of ridding themselves of the blood suckers. The lake was full of these abominable black plagues and they stuck so tight to the skin that they broke in pieces if force was used to remove them.*
>
> *Those who had waded the lake suffered great agony, their limbs becoming swollen and inflamed.... It took us three consecutive days of such toil to pass all our boats through this miserable lake.*[4]

Hubbard's Slough of Despond is now long gone. It was first replaced by the Illinois and Michigan Canal and then by the Chicago Sanitary and Ship Canal, both of which cut through the low divide and Mud Lake. Interstate highway I-55 now also runs over this same course, and factories are built upon the trails of Jolliet, Marguette, LaSalle, and Hubbard.

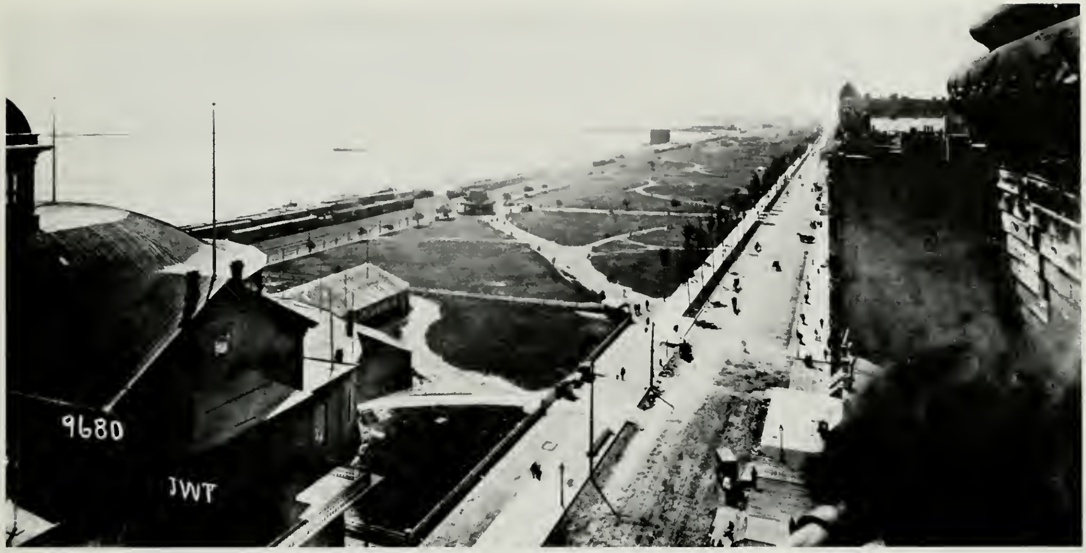
Although the 1821 map uses only one kind of symbol to indicate forest land, there were in fact, different types of forest. Fires that were driven by prevailing westerlies across the prairie and into some wooded areas may have tended to keep the drier woods open. Today, such open woods are sometimes called savannahs. A denser kind of forest was more apt to develop in places less accessible to fire, such as river flood plains, the eastern banks of rivers, and lands isolated by marshes and streams. It is this type of forest growth that remains in the Chicago area today. Black oak, white oak, hickory, and walnut were the trees most commonly noted by the early surveyors. Nearer the lakeshore they encountered black, white, red, and pin oak, cottonwood, pine, and cedar.

The most thoroughly described areas were the forests near the larger settlements. In the Chicago region there were woodlands along the lakeshore both north and south of the Chicago River. Today this area is occupied south of the river by the Hyde Park area and north of the river by the "Magnificent Mile" and the "Gold Coast." Settler John Caton described how the lakeshore appeared in the early 1830s, looking north and south from what is now the Loop:

> *...there were along where Michigan Avenue now is walled with palatial mansions innumerable sand hills rising to a considerable height, overrun by the wild juniper loaded with its fragrant berries at the feet of which stretched away to the southeast the soft smooth beach of firm glistening sand ... along the beach north of the river where also the drifting sand has been piled by the shifting winds into a thousand hills stretching farther back from the waters than on the south, but here the juniper bush was replaced by a stunted growth of scraggy pines often hilled up by the drifting sand.... Further back was a broad ramble among stately oaks sparsely scattered over the even plain among which a horseman could be seen at a great distance, and if one sought a deeper solitude it might be found still further west in the densely tangled mass of bushes among which one could not see a deer at a distance of twenty feet.*[5]

Juliette Kinzie also wrote that the land north of the river was

Chicago Sanitary and Ship Canal under construction in 1890s.



Looking south on Michigan Avenue, from about Adams Street, in late 1880s. Railroad tracks are in same location as today, but just beyond is Lake Michigan shoreline—a few hundred yards west of present shoreline.

> *. . . a vast range of sand hills, covered with stunted cedars, pines, and dwarf willow trees. . . .*[6]

The shoreline was probably very much like that found today at the Illinois Beach State Park, near Waukegan—not at all like beaches of the better known Indiana Dunes.

Today the beach of Lake Michigan within the city limits of Chicago is almost entirely artificial. The prickly pear cactus, once common along the lakeshore, has vanished. In the years since the city's founding the shoreline has been filled, dredged, and bulkheaded beyond recognition. New land has been created, extending the shore a half mile into the lake in some places. Much of the city that was burned in the 1871 fire and reduced to rubble, now forms the foundation of Grant Park, where before there was open water. The gently undulating sand hills that once lay near the shore have been shaved down, and the removed material been used as land fill in the alternating swales—once a rich habitat for plants and animals.

The oak woods that once touched the lakeshore were ideal for suburban settlements that are now neighborhoods such as South Chicago, Hyde Park, and Rogers Park, but segments of forest along the Des Plaines and the north branch of the Chicago River may still be seen. The waterways themselves have been altered beyond recognition; streams have been channeled, rivers straightened, new channels excavated. The section of the south branch of the Chicago River that once touched the original portage site was filled in many years ago when more navigable channels were dug. The wetlands of the Calumet and Portage regions have been drained and filled to make way for residential and industrial areas. A few miniscule parcels of prairie remain near Chicago, but none are to be found within the city limits. A rare prairie remnant within the suburb of Markham, on the south side, is of same type that once comprised much of the wet prairie that stretched to the city's center.[7]

When Chicago area residents realized at last that the natural environments were neither indestructible nor infinite, it was already too late. Their approach to environmental matters must have been similar to that of an Ohio senate committee, which in 1857 airily dismissed suggestions to protect a very common bird:

> *The passenger pigeon needs no protection. Wonderfully prolific, having the vast forests of the North as its breeding grounds, travelling hundreds of miles in search of food, it is here to-day and elsewhere to-morrow, and no ordinary destruction can lessen them, or be missed from the myriads that are yearly produced.*[8]

Fifty-seven years later the last passenger pigeon died.

NOTES

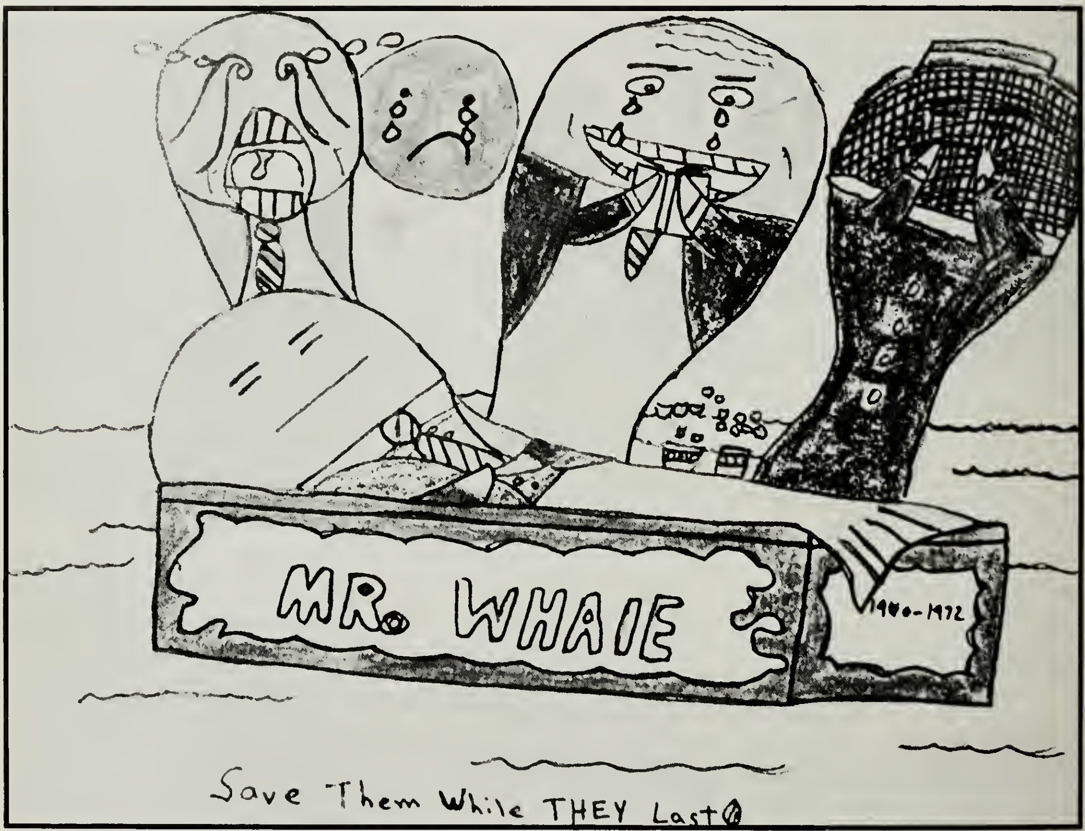
1. *The Autobiography of Gurdon Saltonstall Hubbard;* R. R. Donnelley & Sons, 1911.
2. *A Visitor to Chicago in Indian Days*, by Colbee C. Benton; Paul Angle and James R. Getz, eds., The Caxton Club, 1957.
3. "The Prairies and Joliet," by Harriet Martineau, in *The Prairie State*, by Paul Angle; University of Chicago Press, 1968.
4. Hubbard, op. cit.
5. "John Dean Caton's Reminiscences of Chicago in 1833 and 1834," by Harry E. Pratt; *Journal of the Illinois State Historical Society*, Vol. 28, April, 1935.
6. *Wan-Bun, the Early Day in the Northwest*, by Juliette Kinzie; R. R. Donnelly & Sons, 1932.
7. The combined acreage of prairie remnants near Chicago may not exceed 300. These include the Gensburg-Markham Prairie in Markham and the Woodworth Prairie near Glenview, both of which have been preserved. The Wolf Road Prairie in Westchester, Chicago Ridge Prairie in the southwest suburb of Chicago Ridge, and the Calumet Prairie near Calumet City have not been preserved, but citizens' organizations are currently trying to save them.
8. *Our Vanishing Wildlife*, W. T. Hornaday, New York Zoological Society, 1913.

New Exhibit:

THERE'S A SOUND IN THE SEA

Children's Whale Pictures and Poems

Opening Date: Saturday, May 22.


MR. WHAIE
1900-1972
Save Them While THEY Last!

Douglas Carrier, Age 1

This temporary exhibit, featuring the art and poetry of children, will remain on view in Hall 9 until August 8.

The theme of the exhibit is the slaughtering of the great whales, which has brought some species perilously near extinction. By drawing attention to the plight of these creatures, it is hoped that public concern will be sufficient to influence those bodies responsible for the regulation and enforcement of whaling activities in the oceans of the world.

In addition to the display of about 90 poems, drawings, and paintings—mostly by children under 12, from the United States and Canada—information panels about whales and whaling will be on view. Recorded whale sounds will be played on a continuous tape. The exhibit was organized by Ms. Tamar Griggs, of Vancouver, B.C.; organized and produced by Pacific Science Center, of Seattle; and supported by the National Audubon Society and Smithsonian Institution Travelling Exhibition Service.

A generous selection *of whale and whaling books, ranging in price from $1.00 to $15.95, is available at the Field Museum Book Store. A whale poster and a "Save the Whale" pin may also be purchased; 10% discount to Field Museum members.*

May 6 and 7

Members' Nights

MEMBERS' NIGHTS are those two very special evenings in May when the Field Museum staff traditionally rolls out the red carpet for all its members. It is the only occasion during the year when the Museum holds open house. Curators, technicians, artists, preparators, and Museum educators are on hand to discuss their research, demonstrate techniques, and to answer questions. —All of this embellished with live music and food and drink served in Stanley Field Hall.

Among the many fascinating activities awaiting you on this year's Members' Nights (identical programs both nights) are:

- **Totem pole restoration**—a Field Museum conservator will explain techniques for preserving and restoring these artifacts from the Pacific Northwest.
- Special screenings of films on **volcanoes and earthquakes.**
- Preview of a major forthcoming exhibit opening later this year: **The Pawnee Indian earth lodge.**
- Can you imagine a **monster reptile** that could fly? This one, a pterosaur, had a wingspread of more than 50 feet! You can pop your eyeballs at a fantastic full-scale model of this creature newly hung in Stanley Field Hall.
- Try your hand at operating a **Mexican loom:** spinning and twining and related techniques will be demonstrated.
- See and actually touch a variety of **tropical snakes and other reptiles.**
- View a fascinating film/slide/tape program about the opening of **"King Tut's" tomb**—sealed in Egypt more than 3,000 years ago.
- **Tannery:** See how large animal skins are mounted or prepared for study.
- **Games and craft** participation will be awaiting the youngsters, including the ever-popular *Anthropology Game*—now in its fourth year.
- How to make **natural history collections?** Scientists will show you how to mount and arrange an insect collection and how to dry and mount plant specimens.
- See how the geology preparator works on the restoration of a 19-foot mosasaur, an **ancient swimming reptile.**
- See a fascinating exhibit of **endangered and threatened plant species** of the original thirteen colonies; or, close by, you will be shown a special arrangement of **fungi** common to the Chicago area. A staff botanist will answer questions.
- If you are 15 to 19 years old, perhaps you would like to join **the Field Museum canoe trip** into Canada this summer. Then see the full-hour slide show of last year's canoe trip; trip leaders will be on hand to answer questions.

There is, of course, much, much more; and you can take a break at any time for refreshments and music in Stanley Field Hall. Live music will be performed at intervals throughout the evening by an ethnic instrumental ensemble.

The evening's activities will begin at 6:00 p.m. and continue until 10:00. Free parking will be available in the lot just north of the Museum and in the nearby Soldier Field lot, east of Soldier Field. Free transportation by CTA bus will also be available at 30-minute intervals throughout the evening between the Museum's south entrance and the Loop (stopping at the southwest corner of State and Jackson, southwest corner of Michigan and Jackson, and the southeast corner of Michigan and Balbo).

In addition to complimentary refreshments in Stanley Field Hall, full meal service, reasonably priced, will be available in the cafeteria from 6:00 to 8:00 p.m.

So reacquaint yourself with *your* Museum on Thursday, May 6, or Friday, May 7. The staff looks forward to welcoming you.

THE PAWNEE EARTH LODGE

Preview of a Major Forthcoming Exhibit

By John White

Some 2,000 years ago an American community developed the first truly successful adaptation to life on the Great Plains. This involved the invention of the earth lodge, the development of hunting techniques suitable for the buffalo, and the perfection of a horticultural riverine sedentary lifeway. These people expanded up the various river systems of the Platte and Missouri. Their villages at last were to be found in the foothills of the Rocky Mountains. All along these tributaries of the Mississippi the villages of scattered, rectangular earth lodges could be found.

Then something happened. For some unknown reason the weather became harsh. In the Southwest the Pueblo cultures, at their height, sought the cliff faces to build their fortified settlements. Then these, too, were abandoned. The villages of the rectangular earth lodge builders were covered with many feet of wind-blown silt. We know there was terrible drought in the 1200s. The Norse settlements on Greenland lost contact with Iceland, which in turn lost contact with Europe. The old church annals speak of bitterly cold winters and of summers in which it snowed. Whatever was happening, it was very widespread.

Perhaps a hundred years or so after the square lodges were deserted a new people began to settle up the valley of the Platte River. The weather had become more pleasant. These new people lived in much the same manner as the old. The main differences were that their lodges were now round and the villages were much more compact. It was as if in the interim the spirit of warfare had come to the plains, for the much larger communities were often fortified and occurred on land that was easily defended. The descendants of these people of the round earth lodges became those we know as the Pawnee.

The Pawnee had a reputation for great spiritual wisdom. The Calumet Ritual, the use of a wand with spread-eagle feathers and gourd rattle, is a formalized method to make peace between enemies. It originated in the Pawnee Hako Ceremony. This ritualized mechanism for ending hostilities and promoting peace and good will was found throughout the Midwest by the earliest French explorers.

With the 1800s warfare became endemic on the Great Plains. There were thousands of Siouian-speaking people, as well as expatriate Easterners dislocated by the advancing frontier, all competing with the sedentary villagers for an ever-decreasing supply of buffalo. Then came the forts with their garrisons, followed by ex-Civil War armies, and finally a veritable flood of immigrants in search of land.

The chaos of the last century seemingly crushed Pawnee culture and scattered the pieces to the four winds. The great villages of spacious earth lodges along the Platte River in Nebraska crumbled and returned to the soil. The voices of the old men, the holy songs, the stories, all faded into the ever-blowing wind. There were many who saw the miracles wrought by the men of power, the doctors. The hands that reached down into boiling kettles to bring up choice pieces of meat... the seeds that were planted and grew into mature plants in the space of a few minutes....The children who saw these performances in the great lodges in Nebraska were to travel to the south with their families. To the place called Oklahoma. There they themselves grew up, raised families, and in turn grew old.

The old Pawnee Way became a memory, which became fainter and fainter. It was like a picture puzzle of some painting of great beauty and meaning. Over the years the pieces had become scattered, some of

The author (right), discusses construction of Pawnee earth lodge with Kevin Williams (left), builder of the model, and Sol Tax, director of the Smithsonian Institution Center for the Study of Man.

John White is coordinator of the Native American Program.

them mislaid, others taken away, and many others lost forever. A great many of those pieces of culture still remained with the Pawnee people. There were the stories told by the Old Ones, now long gone. There were songs, ancient songs, each with its history, its own story. For this is the way much history was transmitted in Native North America, it was the song which carried on the memory of an event. The singing united those who had gone on before with those who yet remained, the words and singing style conveyed great depths of meaning and feeling combined. It is difficult to even speak about this phenomenon in English, for it is very different from a history book or lecture. Perhaps those who remember Verdun, in World War I, feel something akin when they hear *It's a long way to Tipperary*, but I don't really know. My mother can sing this song with feeling, with her mind full of memories of handsome young Doughboys marching off to war, but I don't have those memories. To me the song seems stilted and archaic; to many it has probably become high camp, the ultimate indignity. We have much to learn from the Pawnee people, for they honor and respect their history. That which has survived the vicissitudes of time still has meaning.

A major effort is now being made for the first time, to involve a tribe in the development of a significant Museum exhibit. For the first time the fragments of culture that had been scattered to the four winds are being searched out. Artifacts are being documented and photographed. Unpublished manuscripts are being photocopied and the vast anthropological literature sifted through. Photographs are being obtained from the film archives of various institutions, such as the Smithsonian Institute. Pawnee texts and songs, originally recorded on wax cylinders by Dorsey in 1902, have been traced from the Field Museum to Columbia University, to the Library of Congress, and finally to the University of Indiana. Now, tapes of more than 15 hours of old songs, sung by men and women born in the great earth lodges along the Platte River, will be going back to the Pawnee people. The children and grandchildren of some of those singers, now themselves grandparents, listened to their voices here in the Field Museum.

The Pawnee Earth Lodge Project is an attempt to bring a glimpse of history into the Field Museum. Inside an authenticly reconstructed Pawnee earth lodge Museum visitors will be able to hear some of those ancient songs and hear of Pawnee history and culture. They will be able to hear some of the old stories, as told by the Pawnee themselves, and handle replicas of traditional Pawnee craftwork. This appears to be as close to a cross-cultural experience as we can achieve within the Museum walls.

In addition, the Pawnee tribe will be receiving copies of the manuscript materials we have found as well as much documentary information on traditional material culture. The project also funded a traditional crafts and culture workshop in Pawnee, Oklahoma, during the last two weeks of April. Some of the crafts explored were pottery, twined weaving of bags, buffalo-hide tanning, porcupine quill work, and painting of leather. There were also evening sessions of listening to the remarkable old recordings as well as tapings of commentaries by elders.

Through the use of funding from the National Endowment for the Arts, the National Endowment for the Humanities, the W. Clement and Jesse V. Stone Foundation, and matching funds from Field Museum, this complex and multifaceted project is being undertaken. Hopefully, it will serve as a bridge between cultures and as an enrichment to us all.

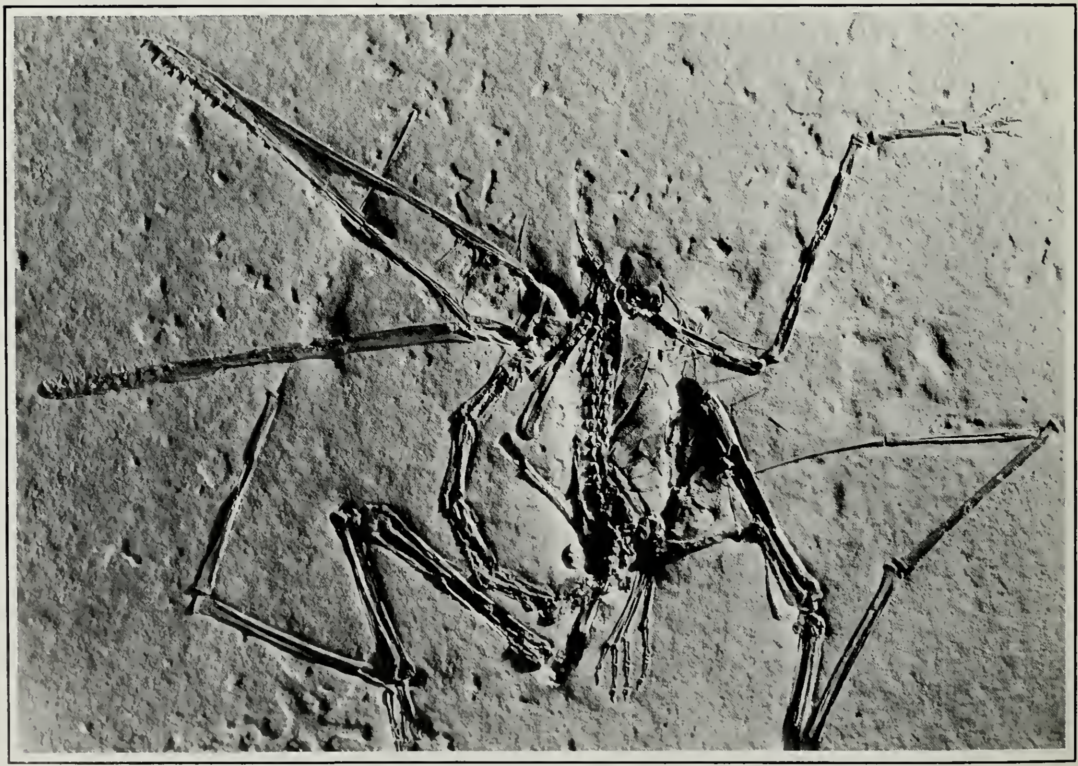
During Members' Nights, the Pawnee Earth Lodge Project staff will be on hand to discuss this major enterprise. ☐

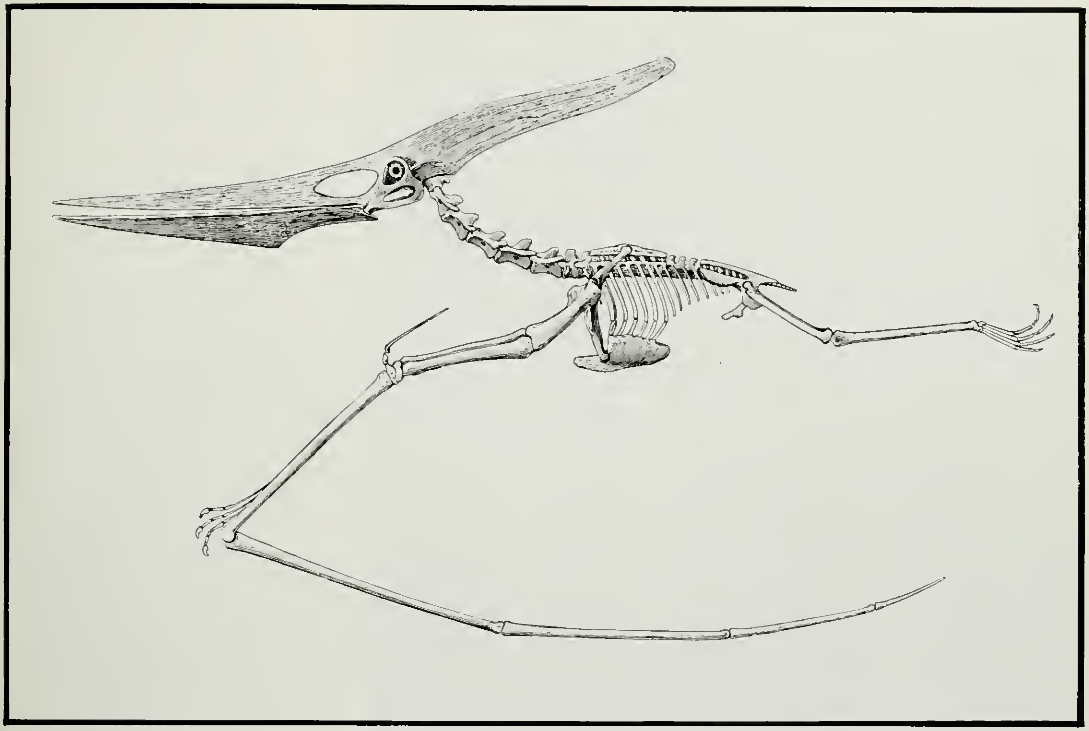
Model builder Williams and author view completed lodge model with delegation of Pawnee Tribe members from Oklahoma. From left: Kevin Williams, Sam Osborne, Myra Eppler, Effie Osborne, Ella Jim, and John White.

PTEROSAUR

Prime candidate for the title "most spectacular creature of all time" is this remarkable flying reptile that flourished more than 65 million years ago. A 50-foot model is on view in Stanley Field Hall.

By John Bolt





Pteranodon ingens, *one of the largest pterosaurs known—an "advanced" species, with short tail and toothless, birdlike beak. Several functions have been suggested for the long, bony crest on the skull. The crest may only have helped to balance the head; or a membrane may have stretched between the crest and the animal's back. Engineering studies suggest that such a membrane could function as a steering device.* Pteranodon *was definitely a fish-eater, as shown by fossilized stomach contents. It also had an expandable throat pouch, which probably served to store food for brief periods.*

The fossil record shows only three groups of flying vertebrates (animals with backbones). Two of these groups—birds and bats—have survived to the present. The third became extinct about 65 million years ago, at the end of the Cretaceous geological period. This group, the pterosaurs (often called pterodactyls), includes the first vertebrates to develop powered—as opposed to gliding—flight and the largest flying animals ever to appear on earth.

For many years, the largest known pterosaur was *Pteranodon,* with a wingspan of about 25 feet. *Pteranodon* is probably one of the most commonly pictured fossil vertebrates, ranking just behind *Tyrannosaurus, Brontosaurus, Triceratops,* and a few other dinosaurs. It has even made the movies, with a cameo appearance in which a model was drawn jerkily along a wire to the terror of the heroine and assorted other cavepersons.

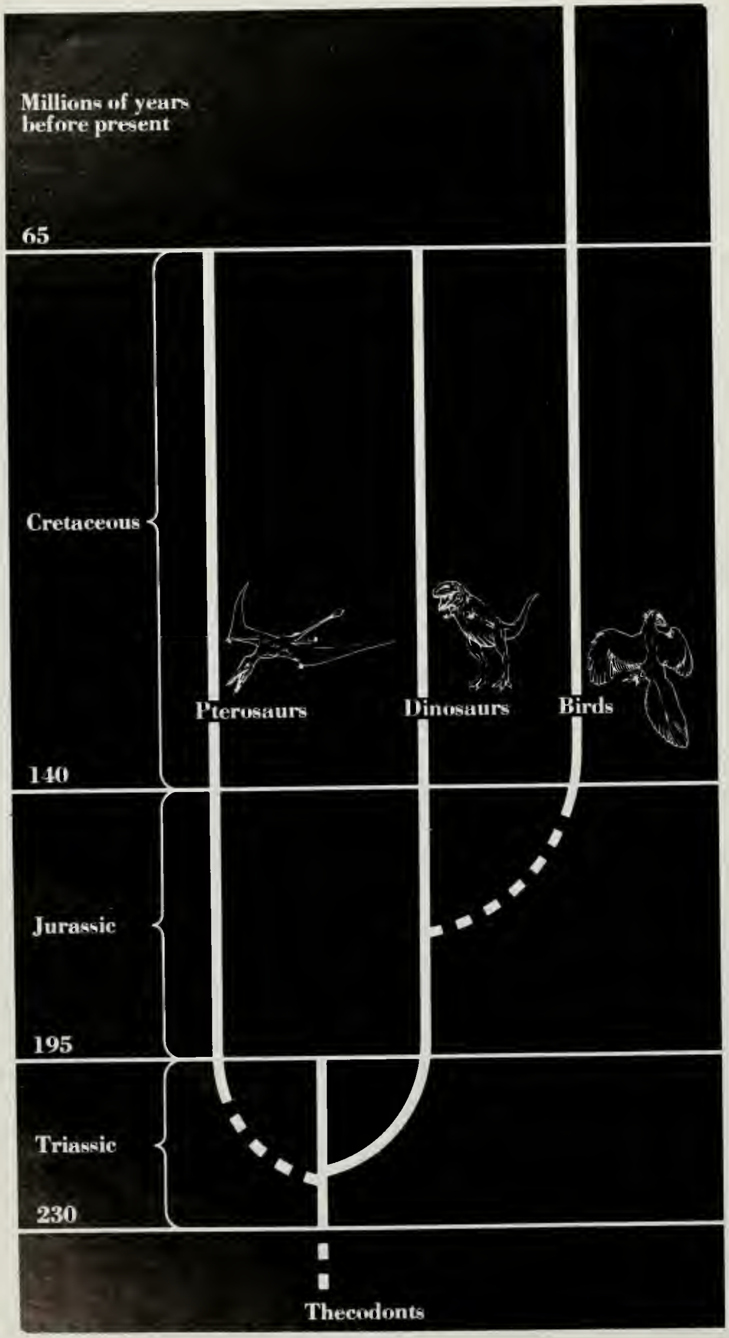
◄ Pterodactylus antiquus, *one of the smallest known pterosaurs. This specimen is shown approximately natural size. Photo is of a cast of a fossil found near Solnhofen, in southern Germany. The original specimen is in a museum in Germany; the cast is on view in Field Museum's special pterosaur display.*

Pteranodon is indeed impressively large; future film-makers, however, will have available an even more monstrous monster. A recent article in the journal *Science* describes a pterosaur with a wingspan of as much as 50 feet. This animal is known from several partial skeletons found in Upper Cretaceous rocks (about 75 million years before present) in Big Bend National Park, Texas. The wingspan has been calculated from incomplete wings, and so may not be exactly 50 feet; it might be somewhat smaller or larger. It is clear, however, that the Texas pterosaur is considerably larger than *Pteranodon,* and is thus the largest flying animal ever found. To give Field Museum visitors some impression of the size of the animal, a kitelike, life-size model has been recently suspended in the north end of Stanley Field Hall. An exhibit of actual, though smaller, pterosaur specimens may be seen in the northwest corner of the second floor.

What sort of creatures were the pterosaurs? Most readers probably know they were reptiles; the "family tree" shown here indicates that they were distantly related to dinosaurs and birds. They were probably warm-blooded, and skin impressions show that at least some had a hairlike body covering. Body impressions also show that, instead of feathers, pterosaurs had a wing membrane made of skin, like that found in bats.

➤

John Bolt is assistant curator of fossil reptiles and amphibians.

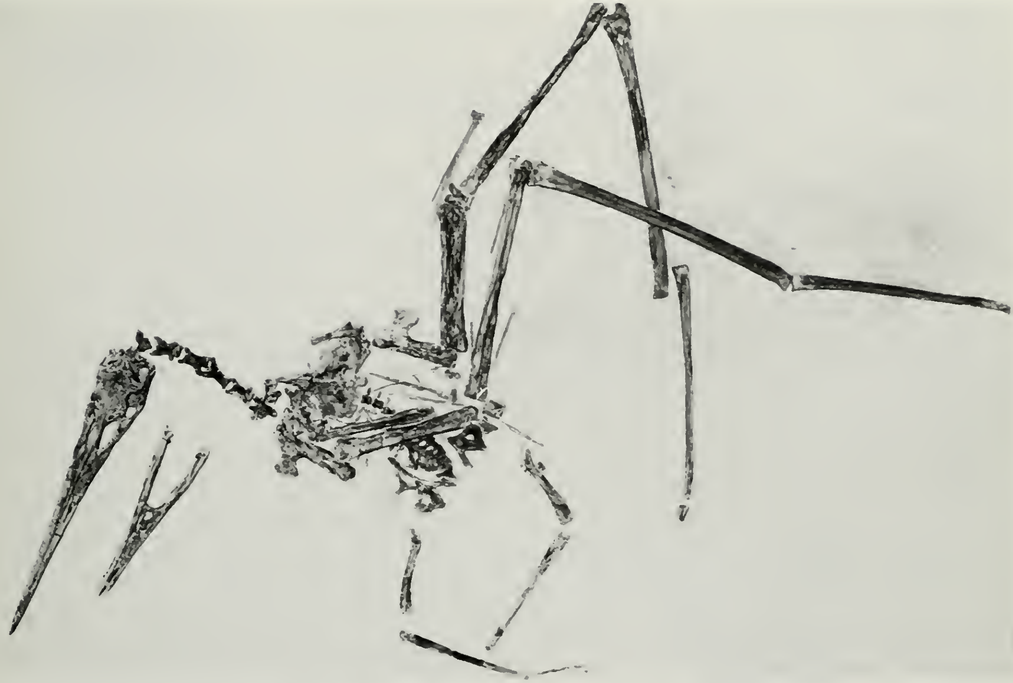


◄*Diagram by Pat Brew*

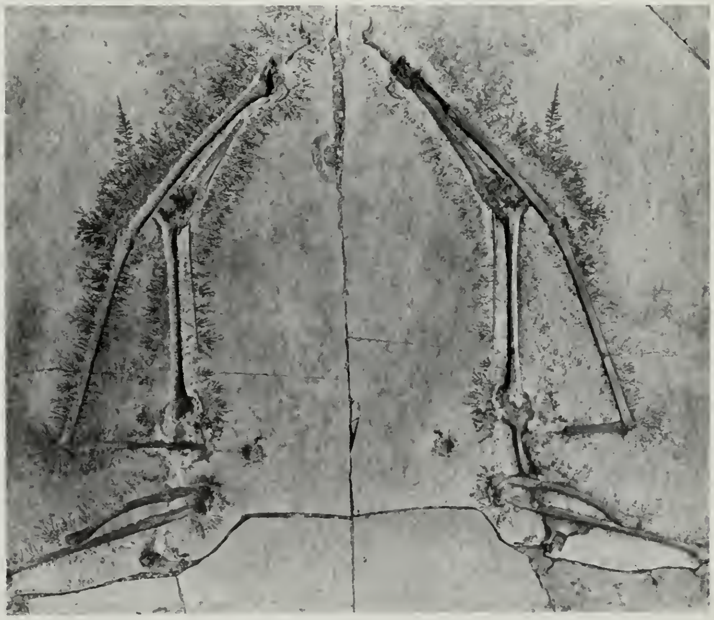
Fossils which preserve such features as skin impressions are, of course, rare; they do reveal a great deal about pterosaurs, however. Some of the most remarkable pterosaur fossils are those showing preserved stomach or mouth contents. These are generally fish remains, although some examples include various invertebrates in addition to fish. The direct evidence thus seems to suggest that pterosaurs were primarily fish-eaters. However, it would certainly be wrong to accept this evidence at face value. In the first place, direct evidence of feeding habits is totally lacking for most kinds of pterosaurs. Second, most known pterosaurs come from sediments which are deposited in shallow seas. Such animals can be expected to rely on marine organisms, including fish, for most of their food. The habits of pterosaurs living near the sea are not likely to be typical of the group. We know very little about pterosaurs from other environments.

One of the most famous fossil-producing areas in the world is near Solnhofen, in southern Germany. In the Upper Jurassic (about 150 million years ago), a shallow sea covered the area around Solnhofen. Limestones that were formed in near-shore areas of this sea preserve many kinds of animals, often with astonishing detail. Among the most interesting fossils from the Solnhofen area are pterosaurs, of which eighteen kinds are now recognized. Most of the pterosaurs on exhibit in Field Museum are from that region. Although most Solnhofen pterosaurs can be broadly characterized as fish-eaters, the variety of sizes and skull types represented shows that there must have been numerous subspecialties even among fish-eaters. The fish-eaters probably hunted on the wing, gliding over the water and seizing prey near the surface. Many were capable of swimming also, using the webbed hind feet as paddles. Some Solnhofen pterosaurs have long jaws which bear thin, closely set teeth in a sort of comb-like arrangement. It has been suggested that the dentition in fact acted as a strainer, allowing the animal to feed on very small animals which it strained out of the water.

Jurassic pterosaurs, including the Solnhofen specimens, are of modest size; the largest has a wingspan of about five feet, the smallest about one foot. Cretaceous pterosaurs, on the other hand, tend to be quite large. The Texas pterosaur is a typical Cretaceous form in this respect; in one way, however, it is quite atypical: it is apparently not a fish-eater. The Texas pterosaur was



▲
Nyctosaurus gracilis, a pterosaur from the Upper Cretaceous of Kansas. Wingspan is about nine feet. This animal, a smaller relative of Pteranodon, *lacks a crest.*



Several hundred specimens of Rhamphorhynchus, ➤ *most of them incomplete, have been found at Solnhofen. This example contains two bones from one wing (near bottom of picture) and most of the bones of a second wing. Two claws belonging to one wing can be seen near top of photo. A sort of mirror effect has been achieved here by splitting the limestone matrix, exposing the specimen; both halves of the slab are shown. The left slab bears the impression of the bones imbedded on the right. Specimen is shown about one-third actual size. Specimen courtesy of Carnegie Museum.*

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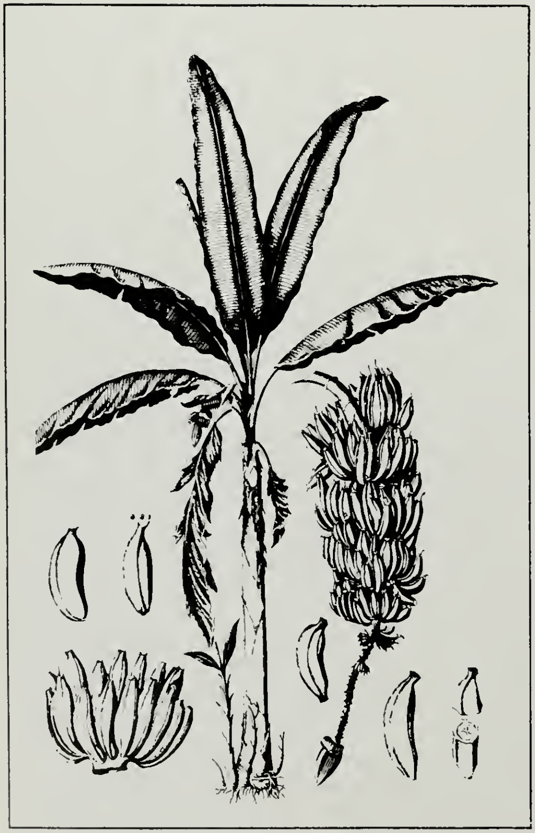
found in an area which, at the time the animal lived, was hundreds of miles from the sea and had no permanent lakes. It is therefore unlikely that the animal was a fish-eater. Clues to its possible feeding habits are found in its long neck, and the fact that its remains were found near the remains of large dinosaurs similar to *Brontosaurus*. The Texas pterosaur may thus have been a scavenger/carrion feeder, like vultures. The long neck would enable it to reach inside even a dinosaur carcass. ☐

Books

Botany of the Black Americans, by William Ed Grimé; Scholarly Press, St. Clair Shores, Mich. 230 pp., $12.50.
Harvest of a Quiet Eye, photographs and text selections by Charles F. Davis, introduction by Edward Way Teale. Tamarack Press, Madison, Wis. 168 pp., $20.00.

April was publication month for two distinctly different, yet equally distinguished, works by a botanist and a photographer. William Ed Grimé, author of *Botany of the Black Americans,* is manager of systematic botanical collections of Field Museum's Department of Botany. Charles F. Davis, whose photographs and text selections comprise *Harvest of a Quiet Eye,* teaches landscape photography at the Museum.

Illustration from Botany of the Black Americans



Musa paradisiaca L. .
From Rumphius, *Herbarium Amboinense* (1747)

Botany of the Black Americans is concerned with the medicinal, nutritional, and other utilitarian and even recreational values that early Black Americans attributed to specific plants; it is also a compendium of observations of early botanists and naturalists to substantiate such claims. Some 245 plant species are discussed by Grimé; of these, he says, 17 owe their presence in the Americas "strictly to the institution of slavery."

A typical entry is that for *Mammea americana* (mammee tree): "A strong resinous gum abounds in the bark of this tree is generally used by the negroes for extracting chigoes (chiggers) from their feet, for on being applied to the part it draws them out bag and all. Melted down with a little lime juice, and dropped into sores, it is effectual in destroying maggots at the first dressing. A bath of the bark hardens the soles of the feet like the mangrove bark."—Noted by J. Lunan in 1814.

An introduction gives us historical perspective on the cultural-economic situation of New World slaves and how this related to needs that indigenous species and plants introduced by the slaves were able to satisfy.

Harvest of a Quiet Eye is a felicitous harmony of text with art. The text for the most part is taken from the journals and other writings of John Burroughs (1837-1921), among the most eloquent nature writers this country has produced; and Davis's eye for selecting good Burroughs may nearly equal his skill in finding good subject matter for his camera.

The creative strength of the book lies, of course, in the 43 stunning color plates—views of nature in her various moods and seasons. There is plenty of justification for comparing the best of Davis's nature scenes to the best of Ansel Adams and Eliot Porter. Subtlety and understatement most often seem to be the desired effect, but there are also scenes of high dramatic content: a latticework of budding branches viewed against a cloudless sky; at twilight, a leafless thicket half-submerged in snow; a carpet of jade-green ferns glowing with filtered sunlight. There are also many historic shots of Burroughs and his friends—these, of course, taken by earlier, though unnamed photographers. The quality of the four-color printing is uniformly high.

Both of the above books may be purchased directly or ordered through the Field Museum Book Store; 10 percent discount to members.

MAY at Field Museum

New Exhibits

FLYING REPTILE EXHIBIT

"Pterosaur." An aluminum and brown-fabric model of the largest known flying creature—an extinct pterosaur (also known as a pterodactyl) now hangs at second-floor-eye-level in Stanley Field Hall. The model has a wingspan of 51 feet and a body length of 31 feet. A special exhibit of pterosaur fossils and a scientifically accurate epoxy model of the skeleton of *Rhamphorhynchus muensteri* are displayed in cases in the northwest arcade, second floor.

ANTHROPOLOGY EXHIBIT

"Anthropology Game." Try to identify the unusual artifacts on display in the South Lounge, second floor.

WHALE EXHIBIT

"There's a Sound in the Sea." A special traveling exhibit, consisting of nearly 90 original whale poems and paintings by children from all over the United States and Canada, opens on May 22 in Hall 9. The images created by the children are fresh, bright, and often poignant.

Special Programs

MEMBERS' NIGHTS, MAY 6 and MAY 7

The Annual Open House for Members features special programs, exhibits, entertainment, and behind-the-scenes activities in the scientific, education, and exhibition departments from 6:00 to 10:00 p.m.

FIELD MUSEUM ON TELEVISION

"What Do You Think It Is?" On Wednesday, May 19, Barbara Reque of the museum's Department of Education, makes a guest appearance on the *What do you think it is?* segment of the Garfield Goose Show at 8:00 a.m. on Channel 9, Chicago.

Continuing Exhibits

BICENTENNIAL EXHIBIT

"Man in His Environment." The most talked-about environmental exhibit in the country deals with natural systems and man's impact on them. *Man in His Environment* asks you to take a global view of the most serious environmental problems now confronting all mankind.

ESKIMO ART EXHIBIT

"19th Century Alaskan Eskimo Art." Compare the new with the traditional in this handsome exhibit of early to mid-19th century traditional art and the souvenir art of the 20th century. Join a public tour each Tuesday at 11:00 a.m. or 1:00 p.m. The exhibit closes June 15.

Continuing Programs

ENVIRONMENT FILM SERIES

"Environment: The Sum of Its Parts." The best and newest environmental films are offered in conjunction with the *Man in His Environment* exhibit. The May theme is "Adaptations for Survival: Special adaptations of flora and fauna." Films are shown at 11:00 a.m. and 1:00 p.m. in the Meeting Room, second floor north.

May 1, 2:	**The Great Barrier Reef** (54 min.)
May 7, 8, 9:	**Baobab: Portrait of a Tree** (53 min.)
May 14, 15, 16:	**Birds Paradise: The Waddensea** (27 min.)
May 21, 22, 23:	**Life in a Tropical Forest** (30 min.)
May 28, 29, 30:	**Polar Ecology: Predator and Prey** (22 min.)

(CALENDAR continued on back cover)

MAY at Field Museum

(CALENDAR continued from inside back cover)

ESKIMO FILM PROGRAM

Contemporary Canadian Eskimo Art and Artists are illustrated in three films which can be seen daily at 12:00 noon. For location, inquire at entrances.

Eskimo in Life and Legend (23 min.)

Eskimo Artist Kenojuak (19 min.)

Kalvak (20 min.)

SATURDAY DISCOVERY PROGRAM

Tours, Demonstrations, and Participatory Activities are offered every Saturday, 11:00 a.m. to 3:00 p.m. Topics vary but often include:

Ancient Egypt—A half-hour tour through the Egyptian collection which includes an explanation of the whys and hows of mummy-making.

Snakes—Live snakes will be featured in the Hall of Reptiles and Amphibians.

Folktales of the Alaskan Eskimo—Half-hour story-telling sessions provide insight into how different regions of Alaskan Eskimos look at and relate to their environment.

Early Man—A half-hour tour traces major trends in the physical and cultural evolution of man.

For specific times for each of the above events, phone the museum, or inquire on arrival at museum entrances.

SPRING JOURNEY FOR CHILDREN

"Eskimo Hunters." A free, self-guided tour includes a "hunt" through the museum's newest exhibit, *19th Century Alaskan Eskimo Art.* All children who can read and write are invited to participate. Journey sheets in English and Spanish are available at the information booth. Bring pen or pencil.

Nature Camera Club Meets

"Quintessence of Africa" will be the topic of Lester Peterson at the Tuesday evening, May 11, meeting of the Chicago Nature Camera Club. His slide show will feature exquisite birds, intriguing animals, handsome people, and turbulent waters. Mr. Peterson is one of Chicago's best known traveler-photographers. Guests are welcome. The meeting convenes at 7:30 p.m.

WEAVING DEMONSTRATIONS

The Ancient Art of Weaving demonstrated on a two-harness, handcrafted Mexican floor loom, by members of the North Shore Weavers' Guild, every Monday, Wednesday, and Friday, 10:30-11:30 a.m. and 12:00-1:00 p.m. On Mondays, May 4 and 18, the demonstrations include spinning. South Lounge, second floor.

Special-Interest Meetings Open to the Public

May 4, 7:30 p.m.	**Kennicott Club** (meets first Tuesday of each month)
May 11, 7:30 p.m.	**Chicago Nature Camera Club**
8:00 p.m.	**Chicagoland Glider Council**
May 12, 7:00 p.m.	**Chicago Ornithological Society**
7:30 p.m.	**Windy City Grotto, National Speleological Society**
May 13, 8:00 p.m.	**Chicago Mountaineering Club**
May 16, 2:00 p.m.	**Chicago Shell Club**
May 18, 7:30 p.m.	**Chicago Audubon Society**

Coming in June

"Between Friends/Entre Amis," a Bicentennial gift of the Canadian people to the people of the United States. The gift: a beautiful temporary exhibit is based on 220 original color prints of the land and the people along the entire U.S./Canadian border. The exhibit was produced by Lorraine Monk, executive producer, Still Photography Division, National Film Board of Canada. Members' preview is tentatively scheduled for June 18.

May Hours

The Museum opens daily at 9:00 a.m. and closes 6:00 p.m. every day except Friday. On Friday, year-round, the museum is open to 9:00 p.m. Food service areas are open 11:00 a.m. to 4:00 p.m.

The Museum Library is open 9:00 a.m. to 4:00 p.m., Monday through Friday (closed May 31). Please obtain pass at reception desk, first floor north.

Museum Telephone: 922-9410

June
1976

Field Museum of Natural History Bulletin

Field Museum of Natural History Bulletin

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Field Museum of Natural History
Founded 1893

Director: **E. Leland Webber**

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CONTENTS

3 **Ancient Ecuador Revisited**
by Jorge G. Marcos, Donald W. Lathrap, and James A. Zeidler

9 **Between Friends/Entre Amis**
New exhibit opens to public June 18

10 **From Birth to Flight:** *Evolution of pterosaur model in Stanley Field Hall*

12 **A Major Acquisition:** *Field Museum receives bequest of important beetle collection*
by Henry Dybas

14 **Tenth Anniversary for Women's Board**
by Ellen Thorne Smith

16 **Members' Children's Workshops**

18 **Field Trips for Members**

19 **June at Field Museum**
Calendar of coming events

COVER

View along Canada-United States border, taken near Melita, in southwestern Manitoba. The photo, by John De Visser, is one of more than 200 appearing in Between Friends/Entre Amis, *a book recently published in Canada. The volume is, in effect, a photo essay on the spirit of friendship pervading the relationship between the two countries. A temporary exhibit, "Between Friends/Entre Amis," opening June 18 in Hall 26, is drawn from a selection of these breathtaking photos. All were taken at points along the border, from the Arctic Ocean to the Bay of Fundy. For more on the book and the exhibit, see page 9.*

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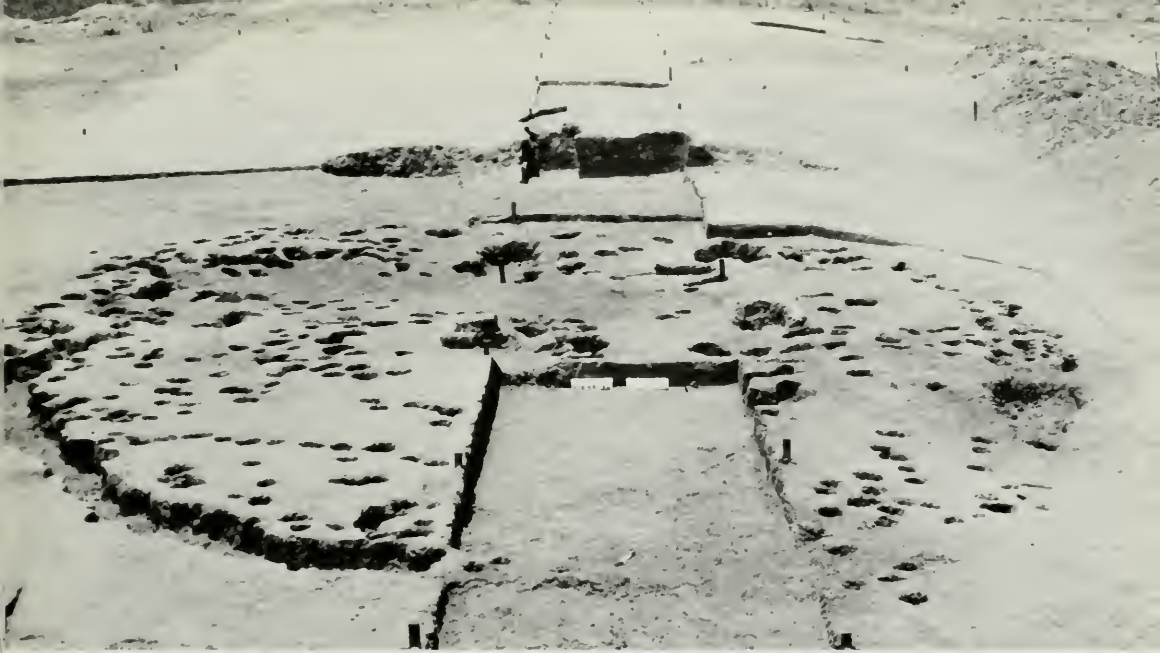


Photos courtesy of the authors

Alignment of houses forming the eastern border of the plaza at Real Alto. The wall trench and postholes of the nearest house have been partially excavated. The wall trench of the next house is unexcavated but visible. The line of houses extends to the most distant point visible in the background.

Ancient Ecuador Revisited

Recent excavations at Real Alto push back by 1,500 years or more the beginnings of settled farm life and the roots of civilization in the Western Hemisphere.

By Jorge G. Marcos
Donald W. Lathrap
and James A. Zeidler

"**Ancient Ecuador**" includes, both in the exhibit and in the catalog, data and hypotheses derived from ongoing research at the Early Formative site of Real Alto, Chanduy Valley, on the coast of Ecuador. Some of the conclusions from these data are quite revolutionary; this is what gives the exhibit its unique vitality. After one year of excavations at Real Alto we would like to evaluate many of the assumptions expressed in the catalog and put forth in that exhibit.

Our excavation has proved beyond all reasonable doubt that Real Alto was a permanently settled village occupied for at least 1,000 years. The 80 domestic structures, the remains of which we found at different levels in the area excavated, have

(Continued on p. 4)

THE FIELD MUSEUM OF NATURAL HISTORY's exhibit Ancient Ecuador: Culture, Clay and Creativity, 3000-300 B.C. *has continued to attract large crowds on its tour to several major United States cities. It is currently on view at the National Museum of Natural History, Washington, D.C., where it can be seen through July 15, 1976, and from there will travel to the Krannert Art Museum, Urbana (Sept. 5-Oct. 3, 1976); the Heard Museum, Phoenix (Dec. 11, 1976-Jan. 25, 1977); and the Minneapolis Institute of Arts (March 8-May 8, 1977) before returning to Ecuador. The catalog is now in its second printing. The authors of this article believe that the success of the catalog and exhibit is attributable to the Field Museum's dynamic presentation of ongoing research.*

The authors have recently returned from Ecuador, where they have finished the first year of a two-year program of excavation by the University of Illinois at Urbana-Champaign, under the auspices of the Graduate Research Board and the Center for Latin American Studies of the University of Illinois, the National Science Foundation, and the Archaeology Museum of the Banco Central of Ecuador. Donald W. Lathrap is research associate, South American archaeology, with Field Museum's Department of Anthropology, and professor of anthropology at the University of Illinois; Jorge G. Marcos and James A. Zeidler are graduate students in the Department of Anthropology at the University of Illinois.—Ed.

permitted us to map the community at several stages of its development. These are only a fraction of the thousands of structures erected during the long occupation of the site. We were able to determine differences in floor plan and settlement patterns for the three major time periods at the site—from the small beehivelike oval houses of the people who lived at the site prior to the introduction of pottery making, through the elliptical large houses of Valdivia II to V, to the similar but less carefully aligned houses of the vast proto-Machalilla occupation at the north end of the site.

It is interesting to note that in Valdivia III times the village was well planned with a long axis of some three hundred meters, roughly oriented north to south; the breadth of the village was about two hundred meters. A linear plaza was surrounded by household structures arranged in a straight line. The better preserved north end of the village was closed in by the alignment of houses. The southern end, now largely destroyed by winds, gullies, and roadbuilding, probably had the same closure. This distribution of houses around the plaza suggests that the floor plan of the houses had served as a kind of modular template for the village plan.

THE PLAZA was divided into a smaller northern precinct and a larger southern one by two mounds that projected from the lines of houses surrounding the plaza. It is apparent that since Valdivia III, two ceremonial structures were maintained on top of the repeatedly resurfaced and enlarged mounds that could be considered prototypes for the obsessively reconstructed pyramids of Classic Maya civilization. By Valdivia VII the village had become an administrative and religious center controlling several farmsteads scattered along the Río Verde and other lesser rivers such as El Río Real, thus managing some 600 acres of riverine agricultural bottom lands. This system of a control center with satellite settlements implies a stratified society, far different from the hunter-gatherers, proto-agriculturalists, or simple fisherfolk who until somewhat recently the Valdivians were thought to be.

In the catalog (p. 13) we read: "...civilization cannot appear until a truly productive agricultural system has been developed." At Real Alto we have a large body of corroborating evidence, indicating that an intensive agricultural system had been in operation since very early in the occupation of the site.

Chronological Chart of the Formative

Based on uncorrected radiocarbon dates

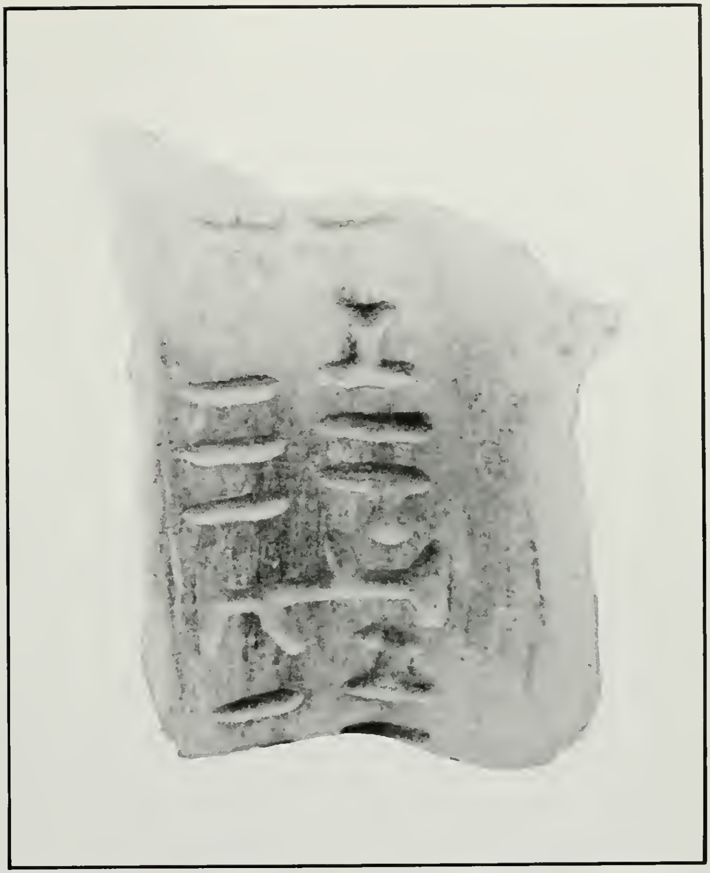
	B.C.	
Chorrera (Engoroy)	300	
	400	
	500	
	600	
	700	
	800	
	900	
	1000	
Machalilla	1100	
	1200	
	1300	
	1400	
	1500	
Valdivia	1600	Phase 8
	1700	Phase 7
	1800	Phase 6
	1900	Phase 5
	2000	
	2100	Phase 4
	2200	Phase 3
	2300	
	2400	Phase 2
	2500	Phase 1
	2600	
	2700	↑
	2800	↑
	2900	↑
	3000	Loma Alta
	3100	

Prior to the excavation of Real Alto we had proof that by Valdivia VI cotton textiles were made on a loom by the people of Real Alto; however, at the bottom of trench C, where the aceramic settlement was exposed, we found spindle whorls of sandstone, which suggest that cotton was being cultivated by the early farmers of Real Alto some 5,500 years ago. We have also found a large amount of ceramic vessels that imitate the bottle-gourd; one of us had discussed in ample detail, in the catalog, the antiquity of bottle-gourd cultivation by the Valdivia people and the pre-Valdivians of northwestern South America. But the most important material that we have obtained through this excavation is several lines of evidence indicating that the Valdivians had developed or inherited an efficient agricultural system based on maize, which reinforces Zevallos' long-held and hotly debated hypotheses.

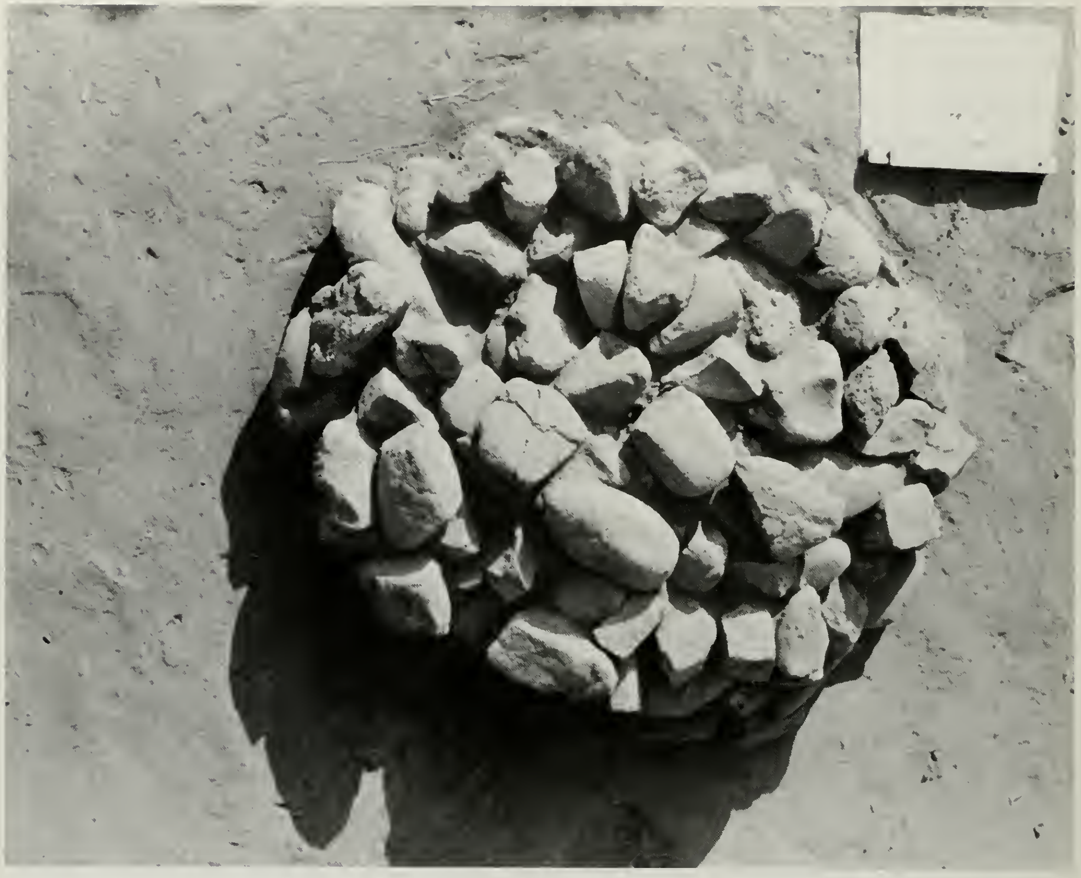
We have found rim sherds decorated with corn kernel impressions (similar to sherds #15 and #16 in the catalog) to be of common occurrence among Valdivia III material, which suggests the importance of corn to the Valdivians, and shows that the grain was generally available for the ceramists of the various households to use as stamps. The large number of *manos* and *metates* that appear at the site—at least one in every two-by-three-meter unit of excavation—indicates the economic importance of these mills. Their use in dedicatory or ceremonial roles suggests that the Valdivians recognized and celebrated such importance. Fragments of the hand-held stones and the milling slabs have been used as the lining for the tomb of a high status burial. A round pit containing fragments of *manos* and *metates* suggests the burial of these fragments, one at a time, by each member of a feasting group, as an offering to Mother Earth to propitiate next year's crop. The careful placement of these tool fragments, deliberately broken at the side of the pit, is our closest approach to masonry, and is strikingly suggestive of what has been found ethnographically among present day native groups, such as the Navajo, who rely on intensive maize agriculture as the basis for their diet.

ARCHAEOLOGICAL comparisons can be brought to bear on the accumulated data from Real Alto to demonstrate further the existence of such an agricultural system. Where we have records of long sequences of cultural development in Mesoamerica it is clear that early groups who relied on hunting for a major part of their diet brought in a very mixed bag of game, and it was only *after* the introduction of intensive maize agriculture that the Virginia white-tail deer became the predominant meat source. At Real Alto the most common animal bones, indeed almost the only mammalian remains, are those of the Virginia deer. It has been noted elsewhere that the Virginia deer becomes part of a maize agricultural system, as it tends to come in great numbers to the maize plots to feed on the juicy stalks. This implies that maize draws the most desirable of protein sources within easy access of the agriculturalist-hunter; at the same time the deer becomes a pest that must be checked in order to maintain the crop.

The large amount of deer bones found at Loma Alta and their proportion in the total animal remains recovered imply that such a maize agricultural system was in operation. Elizabeth Wing (in personal communication), of the Department of Anthropology, Florida State Museum, has emphasized the significance of this high quantity of Virginia deer bones, unusual at a Formative site of Mesoamerica or the Andean area. She has also observed that our recovery of the tiny bones of small fish indicates that the preservation of animal bone is excellent; hence, that the excavated material is a reliable indicator of the original quantities. From Dr. Wing's ob-



Potsherd from Valdivia III (2300-2150 B.C.) with an unusually complex and well executed design made by excision.

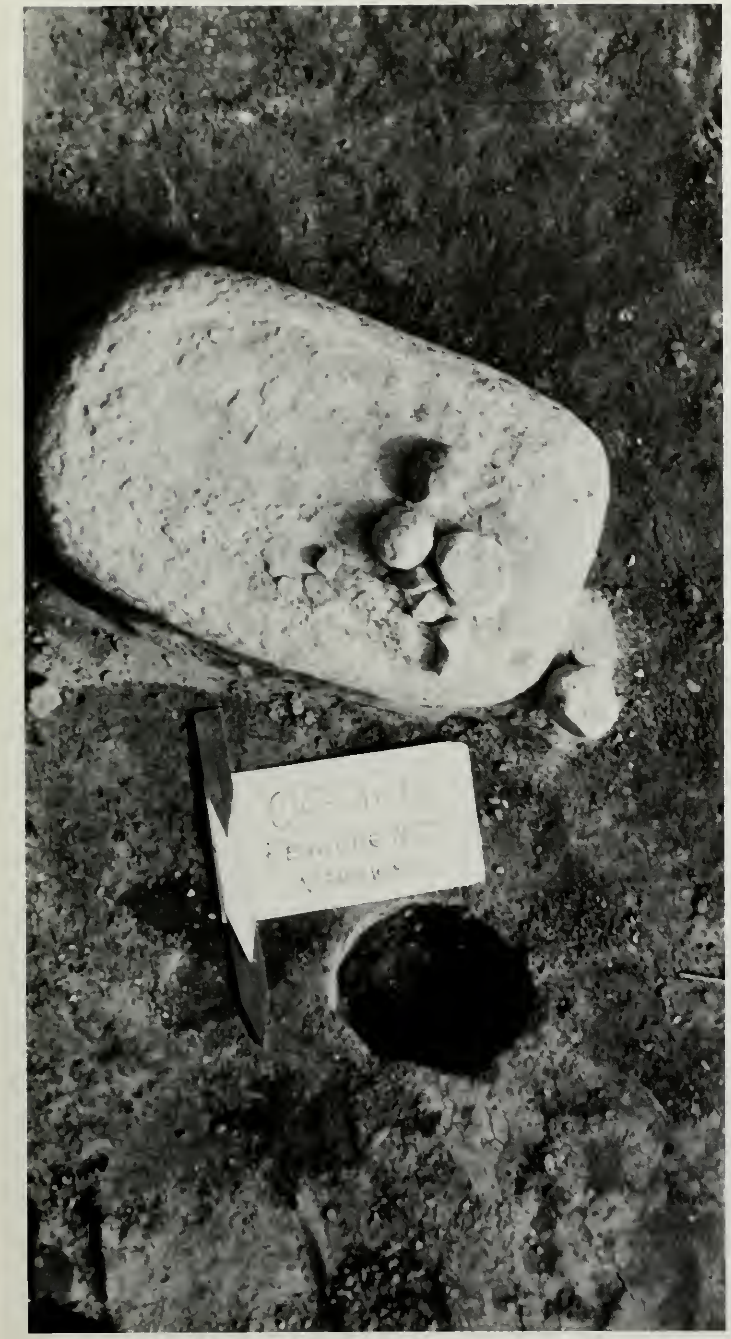


A cache of deliberately broken manos and metates. This offering suggests a ritual related to corn and agricultural productivity.

servations of the fish bones we have learned that there was definitely a preference for three particular species of fish: catfish, Pacific white sea bass, and young sand shark. Dr. Wing has pointed out that fisherfolk will eat *all* varieties of fish, fresh or dried, that they are able to catch, while agriculturalists select the sources of protein that complement their more varied diet.

Real Alto has produced other data that can be compared with existing ethnographic models of groups practicing intensive maize agriculture. Linda Klepinger, a University of Illinois physical anthropologist who worked with us at Real Alto, observed that the excavated adult skeletons exhibited extreme wear on the teeth that could have been caused only by the mastication of an abrasive staple. Dr. Wing noticed that the molars of adult dog skeletons at the site were also severely worn. The ethnographic evidence obtained from present day maize agriculturalists of Central America and Mesoamerica shows that in grinding cooked maize to make the *masa* from which tortillas are prepared, an abrasive sand from the wear of the *mano* and the *metate* becomes included in the cornmeal, making such a staple a very abrasive food. The indigenous maize-eaters of these areas experienced an early wearing down of their molars; and because they fed leftovers to their dogs, the dogs also had the same anomaly.

A very small gastropod, *Cerithidea pulchra*, inhabits the mangrove swamps and muddy estuary beaches, from where the Valdivians collected the bivalve *Anadara tuberculosa*. Unlike *Anadara*, which has a meaty and tasty edible part, this gastropod is quite bitter in taste and the edible portion is too small to warrant the labor of extracting it from the shell. However, after being fired in a split-cane kindled fire, it is easily crumbled to pure lime. Because of its shell structure, *C. pulchra* is an efficient source of lime by volume. It is, or was until a few years ago when the Chanduy mangrove stands disappeared, the favorite source of lime for the valley inhabitants. Today, the El Real women still fire the shells of larger marine gastropods to obtain the lime with which they cook maize, prior to grinding it into *masa*. The amount of *C. pulchra* collected from the site suggests the use of great quan-



tities of lime by the Valdivians. Part of such lime could have been used in the mastication of tobacco and/or coca leaves, but because of all other corroborating evidence we can, with some certainty, suppose that it was used mainly in the preparation of maize.

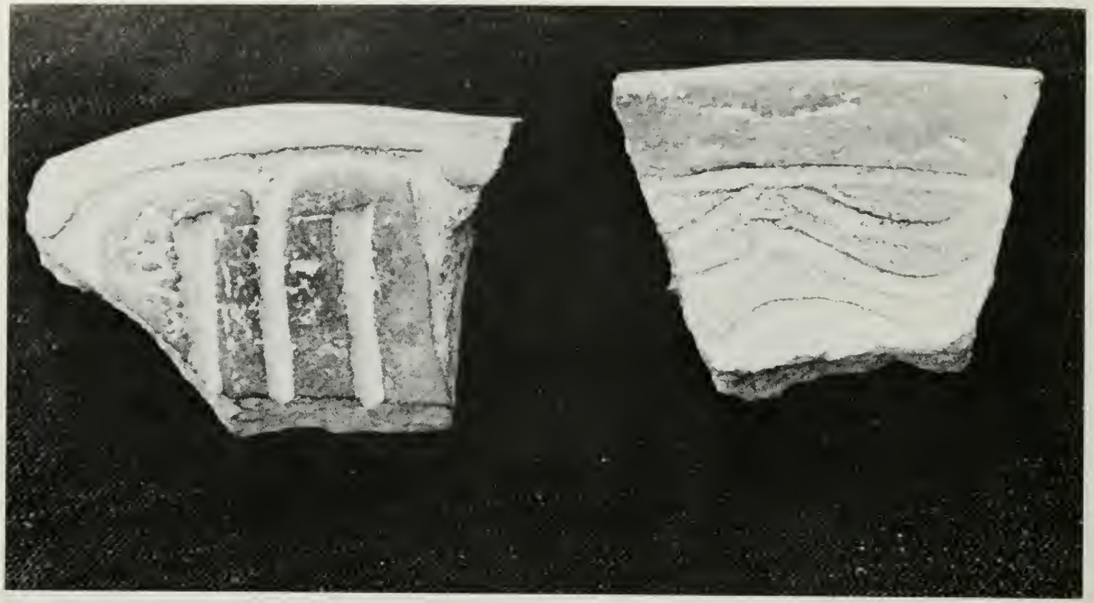
IN REAL ALTO we have been able to observe that the Valdivia ceramic tradition was even richer and more elaborate than had been previously thought. Some remarks follow which revise and update the *Ancient Ecuador* exhibit and catalog.

Prior to the exhibit and the catalog, students of Ecuadorian pottery believed that post-fire crusting, resist smudging, and bichrome finger painting were introduced into the coastal Ecuadorian ceramic tradition by later cultures. However, the Field Museum exhibit shows that these techniques had been used to decorate Valdivia pottery before such contact occurred.

Some vessel forms, namely the neckless olla or *tecomate* and the flat-bottom, flaring-wall bowls also found from the Mesoamerican and Andean Early Formative Periods, are present at Real Alto from Valdivia phases II and III. These forms have been reported as appearing in later Valdivia phases, or are totally absent from the ceramic description in reports from some other Valdivia sites. Their appearance so early in the Valdivia complex at Real Alto will undoubtedly be of great importance in studying Andean and Mesoamerican interrelations with Tropical Forest cultures of northwestern South America.

In the catalog, Lathrap links the beginning of the figurine traditions in Mesoamerica and the Andean area to the figurines which began in Valdivia times in Ecuador. He argues that these earliest Valdivia figurines precede the New World hollow figurine tradition (in Peru, in Mesoamerica, and during the Chorrera period in Ecuador) by 1,000 years. This hypothesis is strengthened by new data recovered in the current Real Alto excavations. The late Emilio Estrada, Ecuadorian archaeologist who did the first work on the Formative Stage in coastal Ecuador, had observed the

◄ *A metate, or hand mill, from the earliest Valdivia occupation at Real Alto. This well shaped mill and the small handstones, or manos, were used for grinding corn.*



Two fragments of pottery made during Valdivia III (2300-2150 B.C.). The excised sherd at the left is typical of the phase. The bowl fragment at the right is decorated with red paint in the zone below the rim. The piece is similar in shape and design to the earliest pottery in Mesoamerica.

existence of hollow figurines in the Machalilla phase. However, these were deleted in the final report of his excavations, and of those he carried out with Clifford Evans and Betty J. Meggers, published in *Smithsonian Contributions to Anthropology*, Volume 1, in 1965. Marcos, while excavating a Machalilla site at Loma Baja, San Pablo, found a realistic breast fragment of a Machalilla hollow figurine (No. 255, *Ancient Ecuador*). There are several other complete examples of Machalilla hollow figurines in the exhibit, and some Valdivia figurines depicting pregnancy. Several of these Valdivia examples are hollow, with a rattle included in the ventral region. These figurines therefore could be considered antecedents of the later hollow figurines. Moreover, at Rio Perdido (OGCh-20), a late Valdivia and Machalilla satellite site to Real Alto excavated by Ron Lippi (University of Wisconsin graduate student), a hollow figurine with the style of head gear, facial treatment, and ear spools typical of the Chorrera *mate* figurines (such as No. 416, *Ancient Ecuador*) was retrieved from a definitely Machalilla stratum. This find, made by rigorously controlled excavation, pushes the beginning of the traditionally "Chorrera style" of figurines to the Machalilla phase.

In this excavation Lippi also found the first Chacras (Manabí) style figurines ever recovered in the Guayas coast, changing an earlier assumption, presented in the catalog, that Chacras figurines were a Manabí variant of terminal Valdivia. The finding of this style of figurine at Rio Perdido shows that the Chacras figurines of Manabí are not a local phenomenon but belong to a widely distributed style at a given time in the development of the Early Formative of Coastal Ecuador.

In this transitional period between Valdivia and Machalilla, a thin, engraved, red to orange ware appears overlying the middle Valdivia deposits at the northeast section of the Real Alto site, mixed with late Valdivia and early Machalilla sherds. A decorative motif occurring at this time anticipates the harpy eagle crest motif (Fig. 80, *Ancient Ecuador*) which in turn relates to the treatment of the harpy eagle crest in Chavín and Olmec art.

Our observations and excavations at Real Alto have produced convincing evidence that the people of tropical northwestern South America had a culture much more elaborate in socio-economic aspects than that of simple fisherfolk or even incipient agriculturalists previously postulated for coastal Ecuador during the Formative Stage. These conclusions push backward 1,500 years or more the beginnings of settled farm life and the roots of civilization in the Western Hemisphere.

It is rewarding to find that the apparently controversial hypotheses formulated in the catalog about the socio-economic development of the Valdivia and Machalilla phases have been proven to be, if anything, rather conservative in scope, since our present data show that many of the phenomena discussed actually began earlier and/or covered a wider area than we had previously estimated. It is also rewarding to see an institution like the Field Museum of Natural History, through the production of the exhibition, presenting some unproven but intentionally provocative hypotheses. Most of all it is our desire that the Ecuadorian exhibit will stimulate an escalating program of archaeological research in this crucial area of the New World. We hope that by 1985 such work will make our present understanding as obsolete as the formulations of the mid-sixties now appear.

New exhibit opens June 18

Between Friends/Entre Amis

"Between Friends/Entre Amis," an exhibit opening to the public in Hall 26 on June 18, is an outgrowth of a recently published book by the same name. The book was conceived as a bicentennial gift from the people of Canada to the people of the United States; and this, too, is the rationale of the exhibit—a selection of stunning, color photos taken from the book.

In the book's forward, Pierre E. Trudeau, prime minister of Canada, observes that the book "is about people—about the Canadians and Americans who live in harmony close to that long thin line known as the International Boundary. It is about the boundary itself, which both links these people and helps to define their separate national identities.

"This book is also a celebration—a joyful recognition of that striking triumph of the human spirit reflected in the atmosphere of peace and friendship which pervades the many relationships between two proud and free nations. It is a celebration, as well, of the two hundredth anniversary of the American Declaration of Independence, and of the innumerable accomplishments of a great country during two centuries of freedom.

"No one should think it strange that Canadians should involve themselves in the observance of an American anniversary. Over hundreds of years we have worked and played together, laughed and mourned together, fought side by side against common enemies. Our two peoples have helped each other repair the havoc of natural disasters, inspired and applauded each other, opened our hearts and our homes to each other as to valued and welcome friends.

"Let no one seek to devalue the achievements of our friendship by glossing over its occasional difficulties. It is true that, as is not uncommon among lifelong friends, we have sometimes had serious differences of opinion, misunderstood each other, struggled against each other's competing ambitions. Long ago we even fought each other, usually in relation to the very boundary which this book illuminates.

"The true nature of our international relationship, however, is revealed by the fact that it is defined not by our differences, but by our capacity and eagerness to resolve them.

"Our International Boundary, and the men and women who view it from opposite sides, have a vitally important lesson to teach other members of the community of nations. It is well expressed on a plaque marking the border line between Alaska and the Yukon Territory—a plaque which proclaims that the friendship between Canada and the United States is 'a lesson of peace to all nations.' "

In 1975, the National Film Board of Canada sent thirty-two Canadian photographers to examine the United States-Canada border. The photographers were asked to interpret the border, to photograph the land and people in the immediate vicinity of it, to document places in both countries where there is a sense of the border present in the daily lives of the people that live there. They were to range more than twenty miles from the International Boundary vista only in the sparsely populated parts of the continent, where people in one of the countries live a considerable distance from their nearest neighbours across the border. The photographers travelled the entire length of the "division with height and length, but no breadth, that is legally the border" and recorded, "objects of interest susceptible of photographic delineation," as had H.L. Hime, a young Canadian photographer who set out to photograph western Canada in 1858.

The result of their work is this remarkable 336-page book, published by the National Film Board of Canada.* On the occasion of the United States bicentennial, President Gerald Ford will receive the first copy.

The temporary exhibit at Field Museum is an extension of the book and, in itself, is "a gift from the people of Canada to the people of the United States." It was produced by Lorraine Monk, executive producer, Still Photography Division, National Film Board of Canada.

Each photo is a distinguished work of art, with the subject matter either a view of the land in its various guises along the boundary, or of those who live, work, worship, or play within a very short distance of the boundary.

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*On sale at Field Museum Book Shop, $29.50; 10 percent discount to members.

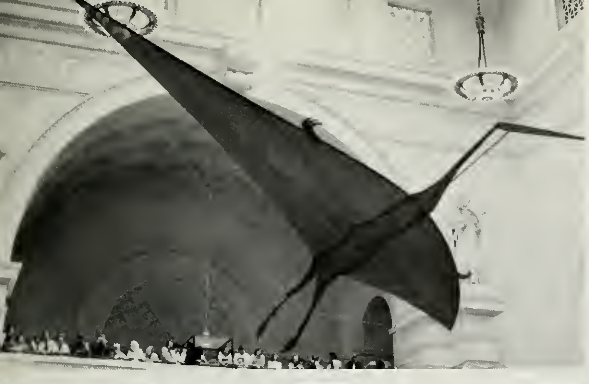
Prospective Volunteers

A three-session Museum orientation for Members interested in joining the Department of Education as volunteers will be held July 8, 15, and 22 from 10:00 a.m. to 3:00 p.m. The sessions are designed to prepare such persons for the role of facilitator—a person who aids groups visiting the Museum by providing information, guidance, and suggestions that will make their Museum visit even more meaningful.

Volunteer facilitators will become eligible for further training to work more extensively with a broad range of educational programs in the Museum.

Interviews with prospective volunteers will be held June 28 through July 2. Please write to Carolyn Blackmon, Field Museum, for further information about the program.

FROM BIRTH TO FLIGHT: *Pterosaur (a stylized model) rises from the floor of Stanley Field Hall and soars to a fixed position at balcony level. At upper left, New York designers Robert Malone and Karen Wermuth discuss the project with Museum staff. In two days Malone and Wermuth assembled the 51-foot, 33-pound model from lengths*



Photos by Dave Walsten

of aluminum tubing, plywood, and nylon fabric. The model will remain on view at Field Museum throughout the summer. In conjunction with the model display, a temporary exhibit of pterosaur fossils and models, together with text and diagrams, may be seen in the balcony area of the second floor, west.

A Major Aquisition: Field Museum Receives Bequest of Important Beetle Collection

By Henry Dybas

LAST FEBRUARY a truckload of steel cabinets was received by Field Museum entomologists with a special excitement, for they contained an extraordinary collection of North American beetles—some 83,000 specimens. The collection was a bequest of the late Joseph N. Knull, for many years professor of entomology at Ohio State University.

The Knull beetles comprise the most important collection of North American insects ever acquired by Field Museum. The collection reflects Knull's special interest in several families of beetles: the longhorn beetles (family Cerambycidae), click beetles (Elateridae), metallic woodborers (Buprestidae), and checkered, or clerid, beetles (Cleridae). These families include many destructive, hence economically important, insects. The collection also includes more than 200 new species that were discovered and subsequently named and described by Knull in the scientific literature.

Josef Knull was born at Harrisburg, Pennsylvania, on October 12, 1891. He attended the public schools of that city and received a B.Sc. in biology from Pennsylvania State College (now Pennsylvania State University) in 1915. He was then employed as an entomologist with Pennsylvania's Bureau of Plant Industry, where he developed his lifelong interest in forest insects, particularly in the beetle families mentioned above. Returning to graduate school at Ohio State University, he received a master's degree in entomology in 1924. From 1930 to 1933 he served as research entomologist with the Forest Research Institute of the Pennsylvania State Department of Forests and Waters, and in 1933 was with the Forest Insect Investigations Division of the U.S. Department of Agriculture. In 1934 he was appointed curator of insects and assistant professor of zoology and entomology at Ohio State University where he subsequently attained the rank of professor, retiring in 1962. Knull died in April, 1975, at the age of 83. In his long career, he published more than 200 papers in economic entomology and on the taxonomy and classification of the several beetle families that are so richly represented in his collection.

The Knull collection contains about 2,700 identified species and 80 to 90 percent of the known United States species within the cerambycid, elaterid, buprestid, and clerid groups. Such a comprehensive representation of species (as with any group of insects) is truly extraordinary, for many species are extremely rare or occur in very limited areas, and a surprising number are still known from only one or a very few specimens. The Knull collection is especially rich in such forms and contains many species that are found in few or no other collections.

Dr. Knull collecting in field, using time-honored method of shaking insects from foliage into umbrella. Photo taken in 1957.

BEETLES, or Coleoptera, constitute the largest order of living things—one of every four kinds of animals on the face of the earth is a beetle. It is difficult to fully convey the diversity and richness of this group. About 270,000 species have already been described and every large collection, such as the Knull collection, contains many additional species that are still to be named. The vastness of the beetle order is suggested by the following anecdote related by the noted Yale ecologist and limnologist, G. E. Hutchinson, in an essay that has become something of a classic in biology:

"There is a story, possibly apocryphal, of the distinguished British biologist, J.B.S. Haldane, who found himself in the company of a group of theologians. On being asked what one could conclude as to the nature of the Creator from a study of his creation, Haldane is said to have answered, 'An inordinate fondness for beetles.'"[1]

Among the many new species of beetles discovered and named by Knull is the large and strikingly colored *Juniperella mirabilis*, shown opposite. The drawing, executed by Knull, reveals his special ability as a scientific illustrator.

Henry Dybas is curator of insects.

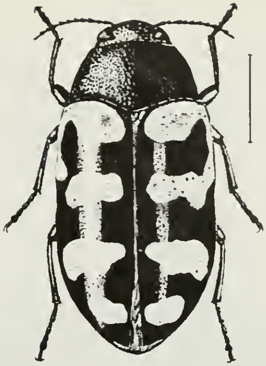
The species, which he found boring into living juniper trees in the Santa Rosa Mountains in southern California, is undoubtedly the most spectacular buprestid beetle discovered in the United States within the past several decades. The name *mirabilis*, in fact, means "marvelous."

The original specimens (known to biologists as *type specimens*) of most of the new species described by Knull are in the newly acquired collection, as well as long study series of many hitherto poorly known species. These study series are important for the extent to which they show variation and geographic and seasonal distribution. For nearly 30 years Professor Knull and his wife Dorothy (in her own right a prominent entomologist, specializing in the leaf-hoppers or Cicadellidae) made summer trips to many parts of North America, particularly to the Southwest, in order to build up their research collection and to add, in other groups of insects, to Ohio State University's general reference collection. Evidence of the sustained collecting that built up Knull's long study series of previously rare or unknown species is readily apparent from the labels on the pinned specimens. The metallic wood-boring beetle *Xenorhipis hidalgoensis*, for example, was first described by Knull as a new species from specimens which the Knulls collected in Texas in 1952. They continued to make collecting trips to the same area over the years, and additional specimens of this species were added in 1953, 1954, 1957, 1961, and 1964, resulting in a long study series. Every drawer in the collection likewise shows the sustained effort and care that were hallmarks of Knull's work.

In the Knull collection, economically important species (which may do damage as larvae or as adults) include twig-borers, wood-borers, wireworms, and round-headed borers; some are destructive to living trees, including fruit trees, as well as to agricultural crops; others, such as certain clerid beetles, are beneficial predators and in some instances are effective in controlling destructive bark beetles.

As the primary reference and research materials of systematic entomology, collections are important in providing a basis for classification and identification by which all the knowledge concerning a species can be stored and readily retrieved. Systematic collections are therefore essential for the applied and more immediately relevant fields of medical, veterinary, agricultural and forest entomology, but they are also basic and essential to much work in the area of ecology and evolutionary biology.

THE SYSTEMATIC COLLECTION at Field Museum, which includes more than 2,650,000 fully prepared insect specimens and more than 102,000 identified species, is used not only by our staff and associates, but by other professional entomologists and graduate students in this country and abroad. Over the years, a great deal of significant research, resulting in a large number of publications, has been based on the study of this collection. For those biologists who cannot come to Field Museum to study specimens in the collection, specimen loans are frequently made by mail. Dozens of such loans, involving many thousands of specimens, are made each year. In 1975 one third of these loans were to scientists in ten foreign countries.



Juniperella mirabilis, *a new species of beetle in the family Buprestidae first described by J. N. Knull in 1947. The drawing is by Knull.*

Dave Walsten

Drawer of Knull beetles is viewed by the author (right) and John Kethley, associate curator and head, Division of Insects.

Although the Knull beetles have been at Field Museum for only a short time, they are already being incorporated into the Division of Insects' systematic collections, and sections of the collection are being studied by specialists. For example, John Chemsak, of the University of California at Berkeley, has examined the Cerambycidae, and is preparing a list of type specimens of this family in the collection. Chemsak is coauthor (with E. Gorton Linsley) of an extensive monograph on the *Cerambycidae of North America*, of which six parts have already been published. Though never a formal student of Knull's, Chemsak's original interest in the Cerambycidae was generated by Knull's 1946 work on "The Long-horned Beetles of Ohio."

Field Museum's indebtedness to Joseph Knull for his gift is great indeed. As part of the Museum's collection it will continue to be valuable as a scientific resource for generations to come.

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1. Hutchinson, G.E., 1959. "Homage to Santa Rosalia *or* Why are there so many kinds of animals?" *American Naturalist*, vol. 43, pp. 145-159.

Tenth Anniversary for Women's Board

By Ellen Thorne Smith

In the early spring of 1966, James Palmer, President of the Board of Trustees of Field Museum, and Leland Webber, Museum director, asked me to organize a Women's Board. This was a great surprise to me, but I was even more surprised to hear myself saying I would try to do so! They promised that there would be little work for me to do (I had heard *that* one before), as I would be given a competent secretary who would take care of everything. My third surprise was that she did! All I had to do was make a tentative list of women board members for the trustees to approve, and Ruth Montgomery, the secretary, would compose a letter inviting them to become "Charter Members."

We started out with the trustees' wives, and asked each to suggest five additional members. I added several natural history-minded friends as well as some active members of the Museum, and acceptances poured in. (Surprise number four!)

Our first event was a luncheon given May 26, attended by 84 ladies, in Mr. Palmer's office, where he gave us a warm welcome. Mr. Webber observed that probably our most important role would be in the field of public relations, explaining the Museum's aims and opportunities to others.

Ably guided by Dr. Donald Collier, chief curator of anthropology, and Dr. Kenneth Starr, curator of Asiatic archaeology and ethnology, we saw the Mayan rubbings—a temporary exhibition—and then visited the third floor conservation laboratory, where Mrs. Christine Danziger, conservator, demonstrated restoration and preservation techniques.

After partaking of a special beverage to alleviate "museum feet," we were served lucheon, and several members stayed on to tour other parts of the Museum.

This first luncheon is typical of many which followed—usually three or four a year, so that by now, ten years later, we have covered all the departments of the Museum and most of the temporary exhibits—except that after a time the "special beverage" became known as "refreshments," and finally as "sherry!"

Our second event in 1966 was a tea in honor of the foreign consuls of Chicago and their wives, given on July 12, a *very* hot day. The committee in charge of this event, chaired by Mrs. William H. Arnold, planned each detail with meticulous care, which accounted for its success.

One member of the Women's Board was assigned as special hostess to each of the 35 consuls. She was briefed in advance regarding her "country-for-the-day," its exhibitions and expeditions, and any of its contacts with the Museum. A brief but impressive ceremony was held during which each consul was presented a special consular membership card, admitting him and his family and the future guests he was urged to bring. The flags of all countries represented were hung from the second floor balcony in Stanley Field Hall, creating a most festive appearance. The Museum staff was especially delighted by this event, as it was felt that consuls so honored would be especially interested in facilitating expeditions to their various countries undertaken by explorers from "their Museum."

On September first, we were honored by being allowed to benefit from the Marshall Field presentation of its Fall Designer Collection and luncheon at the Sheraton-Blackstone Hotel. By then there were 155 charter members of the Women's Board, with acceptances still coming in, and a nominating committee was appointed to select officers. Mrs. Homer Livingstone consented to be chairman, and the committee members were Mesdames Robert Gwinn, Gaylord Freeman, Jr., and Joseph L. Block. They proposed the following slate, which was elected for two years: Mrs. Hermon D. Smith, president; Mrs. Walter A. Krafft, first vice president; Mrs. Claude A. Barnett, second vice president; Mrs. George H. Watkins, secretary; Mrs. Thomas M. Ware, assistant secretary; Mrs. Austin T. Cushman, treasurer; and Mrs. Robert E. Straus, assistant treasurer. All agreed to continue in office for one additional year, with the exception of Mrs. Straus, who asked to be replaced. She was succeeded in 1968 by Mrs. Thomas E. Donnelley II. Several committees were formed, Miss Nora Chandler heading both the program and volunteer committees; Mrs. William D. MacKenzie, publicity; and Mrs. R. Winfield Ellis, decorating. In 1967 two more committees were added: Mrs. Henry P. Isham, by-laws; and Mrs. Gardner H. Stern, social (planning menus and table decorations and similar arrangements). Officers and all committee chairpersons formed the executive committee, which met approximately once a month.

In the spring of 1968 Women's Board Secretary Ruth Montgomery decided to return to her native Alaska, and her place was ably taken by Virginia (Mrs. David) Straub, who retired this past January, giving up the reins to Alexandra "Lexi" Mente.

Our meetings were often scheduled as previews for temporary exhibits such as "Color in Nature" and "Contemporary African Arts," or the accession of some specific object of unusual interest, such as the great auk (an extinct bird species), which was combined with a visit to the Division of Birds, or the coelacanth (which had been thought extinct)—leading us to the Division of Fishes.

The opening of new permanent exhibits such as "Man in His Environment" called for special evening previews, which ranged from small dinners of 200 for the Tibetan Hall opening (1967), to 860 for the Contemporary African Arts Festival. Some were formal seated dinners, and some have been informal "sit where you like" buffets. Our first formal ball was a dinner dance sponsored by the Women's Board to celebrate the 75th anniversary of the Museum's founding, and to dedicate the new Stanley Field Hall. Just before the occasion, several sparrows had flown

Dave Walsten

The author (left) chats with outgoing Women's Board President Mrs. Thomas E. Donnelley II at recent board luncheon.

into the hall and perched in the fig trees, which would never do. The Division of Birds suggested mixing bird seed with whiskey to make them easy to catch. All the day before we tried this, but the birds flew out the doors—for air, we think.

The late Jean Harvey chaired a committee of expert decorators: Maud Moss, Catharine Ellis, and Eleanore Palmer transformed the new hall into Fairyland. The 450 guests were greatly impressed when their cars and taxis were ushered over the sidewalk to an awning-covered red carpet, leading up all those front stairs, but they gasped as they came in the door. Lights played on the fountains, and shone from each of the flower-filled balcony openings above both sides of the hall, while the center floor was covered with beautifully decorated tables, each with its own set of tall candelabra.

In December of 1969 Mary Ward dreamed up an Old Fashioned Christmas Afternoon Wassail Party for young and old. The Women's Board bought Christmas decorations and a fireproof decorated Christmas tree some thirty feet high, designed to last for years. The party was such a success that we repeated it in December, 1973, under Sally Searle's management. The Women's Board has set aside a sum sufficient to replace tired decorations each Christmas, including the tree if necessary.

The gala event for 1975 was a dinner party on April 17 for the opening of the exhibit "Ancient Ecuador: Culture, Clay, and Creativity 3,000-300 B.C." with Mrs. Patrick Shaw as party chairman. The way to plan a good party, she observed, was to get a good committee and sit back. The Museum staff made everything so easy. To Virginia Straub, who was absolutely indispensable, she presented the "Stanley Field Hall Mirth and Hilarities Award."

Our most recent dinner, run by Mary Ward, was November 7, 1975—a fitting opening for the "Man and His Environment," the exhibit so carefully planned by the Museum, and so long in the making.

But the Women's Board is not all glamour and entertainment. We have interested ourselves in all kinds of Museum activities, such as volunteering to help in different departments (11 Women's Board members are currently Museum volunteers) and docent training with the Raymond Foundation, taking children and their teachers on guided tours. Three of the Women's Board members sit on the Museum Board of Trustees; eight serve on trustee committees.

Although fund-raising is not formally part of our job, we suddenly found ourselves in the midst of the $25 million Capital Campaign, and an amount of $1.8 million was attributed to efforts of the Women's Board. And now the Commitment to Distinction campaign. Where and when will it all end? The obvious answer is "Never." For the task of maintaining Field Museum is a many-faceted one, with new projects, new exhibits continually being dealt with. The Women's Board takes great pride in having been so closely involved with such activities in its first ten years of life. We look forward to many more.

New Women's Board Officers

The new president of Field Museum's Women's Board is Mrs. Joseph E. Rich, elected at the board's annual meeting on May 11. Mrs. Rich succeeds Mrs. Thomas E. Donnelley II, who was elected in 1974. Other new officers elected at the meeting were Mrs. Edward F. Swift, second vice-president; Mrs. Robert Wells Carton, recording secretary; Mrs. T. Stanton Armour, corresponding secretary.

Continuing in their respective offices are Mrs. Leonard S. Davidow, first vice-president; Mrs. Philip K. Wrigley, third vice-president; and Mrs. Arthur S. Bowes, assistant treasurer.

Newly elected members-at-large are Mrs. Gordon R. Ewing and Mrs. Noel Seeburg, Jr.; Mrs. Corwith Hamill, Mrs. Gardner H. Stern, and Mrs. Frank H. Woods are continuing as members-at-large.

Women's Board Presidents
1966–1976

1966-69: Mrs. Hermon Dunlap Smith
1970-71: Mrs. Edward Byron Smith
1972-73: Mrs. B. Edward Bensinger
1974-75: Mrs. Thomas E. Donnelley II
1976- : Mrs. Joseph E. Rich

MEMBERS' CHILDREN'S WORKSHOPS

July, 1976

Members' Children (or grandchildren) are invited to participate on Wednesdays in July Workshops. The workshops offer children an opportunity to work with actual specimens and learn scientific and ethnological techniques. The programs for younger children last about one hour, those for older children about one hour and a half.

July 7

INSECTS

Elizabeth Deis—Leader
10:30 a.m. Ages 7—9
1:00 p.m. Ages 10—13

Where to find insects—(in some unexpected places)
Ways to catch them—(easy and strenuous)
How to keep them—(alive or dead)

July 7

LIFE IN AN OLD DEAD TREE

Marie Svoboda—Leader
10:30 a.m. & 1:00 p.m. Ages 6—7

An old dead tree may not look like much to us, but to certain kinds of animals, it is a great place to live. This program reveals the different kinds of animals that might be found living in such a tree.

July 14

AFRICAN DRUMS AND STAMP DESIGNS

Morning 10:30 a.m. Grace Fuller and Jean Carton—Leaders
Afternoon 1:00 p.m. Natalie Newberger—Leader
Age 7—9

Learn African rhythms and dance steps to the beat of West African drums and gongs, and produce designs using Ashanti stamps with authentic Adinkra symbols.

DINOSAURS TO SERPENTS

Ann Ross—Leader
10:30 a.m. Ages 7—9
1:00 p.m. Ages 10—13

Learn about a turtle weighing as much as 600 pounds, a snake as long as 30 feet, and a lizard that runs on the water. Find out about reptiles big and small and how they are related to dinosaurs and other prehistoric reptiles.

July 21

THE ART OF CHINESE PAPER CUTTING

Edith Fleming—Leader
10:30 a.m. & 1:00 p.m.
Ages 10—13

Learn the Chinese technique of cutting paper designs free hand and producing rubbings from them.

A BIRD IN THE HAND

Lorain Stephens—Leader
10:30 a.m. Ages 7—9
1:00 p.m. Ages 10—13

An introduction to the world of birds: their structure, ecology, behavior, and some ideas on how to become better acquainted with them.

July 28

FOSSILS

Martha Lussenhop & Ellen Hyndman—Leaders
10:30 a.m. & 1:00 p.m.
Ages 10—13

What is a fossil? How are fossils formed? Learn to identify fossils and to understand ways living things are fossilized.

PLANT IMMIGRANTS

Phil Hanson—Leader
10:30 a.m. & 1:00 p.m.
Ages 10—13

Participants will study some of the weeds and other plants that are not native to this part of the country. How did they get here and how did they survive?

Reservations are necessary and we urge that they be sent in early. The size of each session is limited and applications will be processed in the order they are received. A child can be scheduled into only one program. Please send a separate application for each child in your family who wishes to participate.

Please send coupon or
facsimile to:
Children's Workshops
Field Museum
Roosevelt Rd. at
Lakeshore Dr.
Chicago, Ill. 60605

Application for July Workshops

	Program	Date
1st choice		
2nd choice		
3rd choice		
4th choice		

Name ______________________________
Address ______________________________
Membership in name of ______________________________

Members' Field Trips

To help you in your future planning, Field Museum is happy to make advance announcement of three field trips planned for this summer and fall. In order to avoid disappointment sign up early—space is limited. All trips will be led by Field Museum staff scientists.

Shark Fields of Parke County, Indiana

Aug. 12—15, 1976

4 days—3 nights

Limited to 20 persons selected in order applications are received. We will explore an area where Field Museum scientists have collected hundreds of fossil sharks from black shale of the coal age. The group will be guided on foot through rough country by Dr. Rainier Zangerl, former chairman Department of Geology, and Dr. Eugene R. Richardson, curator, fossil invertebrates. There will be opportunities to examine the rocks found in shrinking ponds where sharks were trapped millions of years ago. Participants may themselves find sharks and associated animals. The hikes will be rugged, for which appropriate clothing will be needed. Good food and comfortable motel rooms will be the reward at the end of the day. The group will travel on an air-conditioned motor coach. Total cost. $172.50 per person.

Late Summer Weekend in Historic Galena, Illinois

Aug. 28—29, 1976

Dr. Matthew H. Nitecki, curator, fossil invertebrates, will conduct a study tour through the geological area (once a major lead-producing region) of this history-laden river town, which is built on rocky limestone bluffs. A tour of President Ulysses S. Grant's home will be included in the itinerary. Saturday evening will be free for participants to enjoy the charming downtown area, with its unique variety of pre-Civil War architecture. Total cost: $62.50 per person.

Michigan's Upper Peninsula

Sept. 27 through Oct. 1, 1976

5 days—4 nights

A five-day geology-botany trip. The group will travel by air-conditioned motor coach to Marquette, Mich. There we'll visit geological localities that show the roots of an ancient Precambrian mountain chain that once stretched across this region. A visit will be made to a working iron mine and its ore-milling operations, following the ore from rough form to pellets ready for shipment to steel mills.

The unique plant life of an acid bog and the maple-beech-hemlock forest in autumn colors will be the botanical highlights of the trip. The weather should be cool and pleasant, and the fall colors at their peak brilliance. The trip, limited to 44, will be led by Dr. Edward Olsen, chairman of the Department of Geology, and by Dr. William Burger, associate curator of botany. Cost of the trip: $260.00 per person.

Trip fee includes cost of motel rooms, transportation, meals, and gratuities, based on double occupancy. A small additional fee will be charged for single accommodations. Reservations may be made by writing to the Membership Department, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive. A $25.00 deposit should accompany your application. For further information please call Dorothy Roder, 922-9410, ext. 219.

EGYPT TOURS FOR 1977

Several trips to Egypt during January, February, and March, 1977, are planned, jointly sponsored by Field Museum and the Oriental Institute of Chicago. The itinerary has not been finalized, but each will be about 18 days long. Further information will be announced later. The tours will be open to members of both institutions. Interested Museum Members should write to Mrs. Dorothy Roder, Membership Secretary, Field Museum of Natural History, Roosevelt Road and Lake Shore Drive, Chicago, Ill. 60605.

Members' Nights: 19,566 Guests!

Members' Nights this year (May 6 and 7) once again proved to be events of special interest to Field Museum members, with nearly 20,000 persons attending; 8,571 came to Thursday night's open house, 10,995 to Friday night's. This compared to a combined total of 6,933 in 1973, 12,092 in 1974, and 15,551 in 1975.

Fifty-eight persons took out new memberships on the two evenings, including one life membership. Szabo Food Service, the Museum's caterer, was kept busy dispensing 66,000 cookies, 700 gallons of fruit punch, and 100 gallons of coffee.

JUNE at Field Museum

New Exhibit

CANADIAN BICENTENNIAL EXHIBIT

"BETWEEN FRIENDS/ENTRE AMIS." An exhibit of 220 original color prints of the land and the people along the entire U.S./Canadian border opens June 18 (Members' Preview, June 17). The exhibit, in Hall 26, is a Bicentennial gift from the Canadian people to the people of the United States and was produced by the Still Photography Division of the National Film Board of Canada.

New Program

SUMMER JOURNEY FOR CHILDREN

"FRIEND OR FOE?" A free, self-guided tour about animals that have been feared, misunderstood, or misrepresented in the past—such as the bat, toad, wolf, hyena, rattlesnake, tarantula, and coyote. All children who can read and write are invited to participate. Journey sheets in English and Spanish are available at the information booth. Bring pen or pencil.

Last Chance to See

ESKIMO ART EXHIBIT

"19TH CENTURY ALASKAN ESKIMO ART." Compare the new with the traditional in this handsome exhibit of early to mid-19th century traditional art and the souvenir art of the 20th century. Exhibit closes June 15.

ESKIMO FILM PROGRAM

CONTEMPORARY CANADIAN ESKIMO ART AND ARTISTS are illustrated in three films which can be seen daily at 12:00 noon. For location, inquire at entrance.

Eskimo in Life and Legend (23 min.)
Eskimo Artist Kenojuak (19 min.)
Kalvak (20 min.)

Special Exhibits

WHALE EXHIBIT

"THERE'S A SOUND IN THE SEA." This special exhibit features nearly 90 original whale poems and paintings by children from all over the United States and Canada. The images created by the children are fresh, bright, and often poignant. Hall 9, through August 8.

FLYING REPTILE EXHIBIT

"PTEROSAUR." An aluminum and brown-fabric stylized model of the largest known flying creature—an extinct pterosaur—now hangs at balcony level in Stanley Field Hall. The model has a wingspan of 51 feet and a body length of 31 feet. A special exhibit of pterosaur fossils and a scientifically accurate epoxy model of the skeleton of *Rhamphorhynchus* are displayed in cases in the northwest arcade, second floor.

BICENTENNIAL EXHIBIT

"MAN IN HIS ENVIRONMENT." Six areas that wind through 8,000 square feet of exhibition space include two film theatres. A salt marsh—recreating one at Sapelo Island, Georgia—offers a unique opportunity to study basic ecological principles within a total marsh environment. *Man in His Environment* takes a global view of some of the most serious environmental problems now confronting all mankind and asks visitors to involve themselves in decisions that have to be made. Hall 18.

(CALENDAR continued on back cover)

JUNE at Field Museum

(CALENDAR continued from inside back cover)

(CALENDAR continued from inside back cover)

Special Programs

ENVIRONMENT FILM SERIES

"ENVIRONMENT: THE SUM OF ITS PARTS." The best and newest environmental films are offered in conjunction with the *Man in His Environment* exhibit. The June theme is "An Endangered Animal: The Whale." Films are shown at 11:00 a.m. and 1:00 p.m. in the Meeting Room, second floor north.

June 4, 5, 6:	*In Search of the Bowhead Whale* (50 min.)
June 11, 12, 13:	*Whales* (22 min.)
June 18, 19, 20:	*Whales, Dolphins and Men* (52 min.)
June 25, 26, 27:	*After the Whale* (30 min.)

EVERY SATURDAY

"DISCOVERY PROGRAM." Tours, demonstrations, and participatory activities are offered every Saturday from 11:00 a.m. to 3:00 p.m. Topics vary but often include:

Ancient Egypt—A half-hour tour through the Egyptian collection, including an explanation of the hows and whys of mummy-making.

Snakes—Live snakes are featured in the Hall of Reptiles and Amphibians.

Folktales of the Alaskan Eskimo—Half-hour storytelling sessions provide insight into how Alaskan Eskimos of different regions view and relate to their environment.

Early Man—A half-hour tour traces major trends in the physical and cultural evolution of man.

For specific times for each of the above events, phone the museum, or inquire on arrival at museum entrances.

Special-Interest Meetings Open to the Public

June 1, 7:30 p.m.	**Kennicott Club** (meets first Tuesday of each month)
June 4, 8:00 p.m.	**Chicago Anthropological Society** (meets first Friday of every month)
June 8, 7:30 p.m.	**Chicago Nature Camera Club**
June 9, 7:00 p.m.	**Chicago Ornithological Society**
7:30 p.m.	**Windy City Grotto**
June 10, 8:00 p.m.	**Chicago Mountaineering Club**
June 13, 2:00 p.m.	**Chicago Shell Club**
June 22, 7:30 p.m.	**Chicago Audubon Society**

Coming in July

"MEMBERS' CHILDREN'S WORKSHOPS," mornings and afternoons on Wednesdays. Throughout July. Advance registration essential. For details see p. 14.

"THE TRIBAL EYE." The outstanding film series, produced by Britisher David Attenborough, illustrates tribal societies from the Arctic to Africa—their rituals and their art. The series will be shown at the museum on Fridays, Saturdays, and Sundays starting in July.

Summer Hours

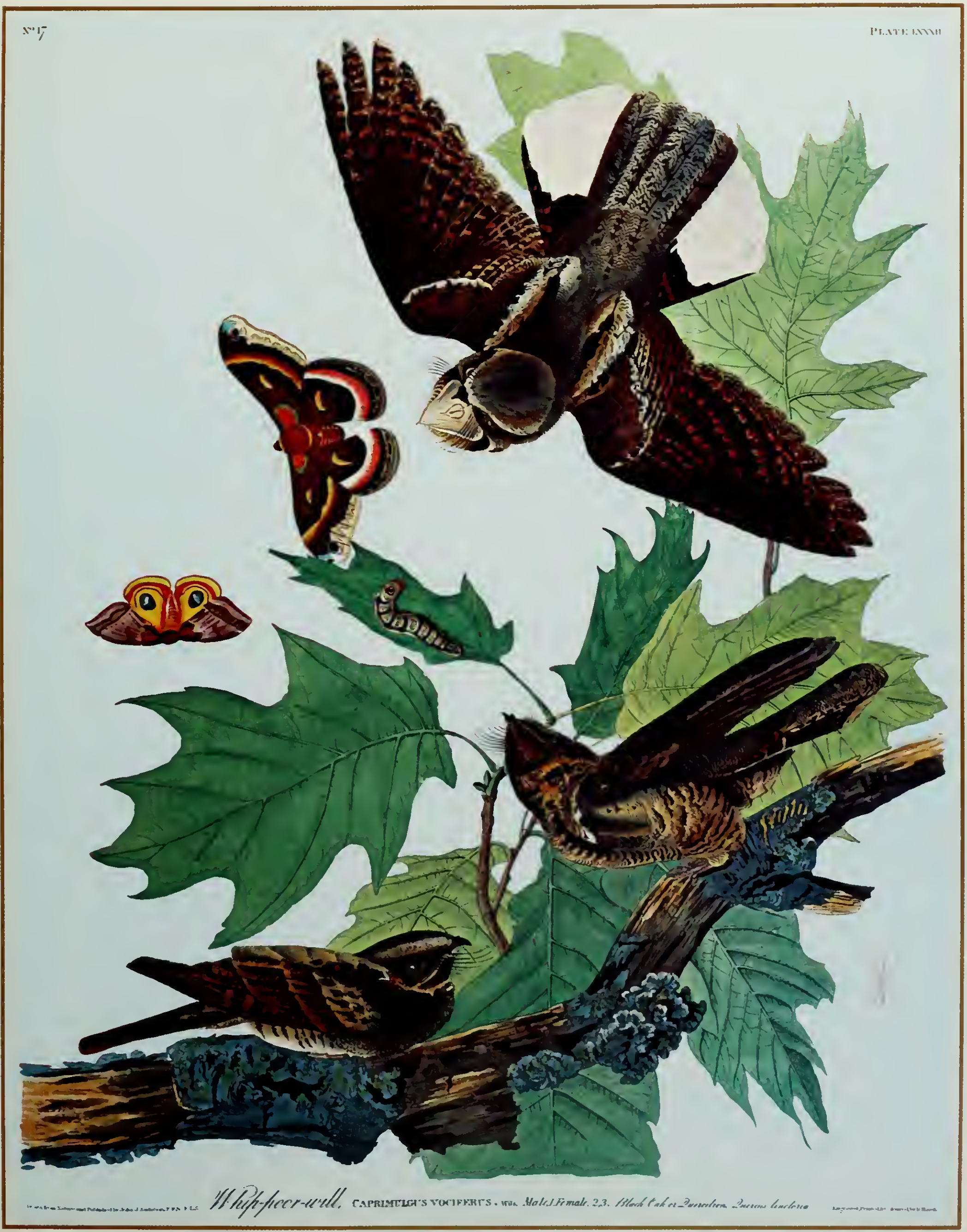
THE MUSEUM opens daily at 9:00 a.m. and closes at 6:00 p.m. every day except Friday. On Friday, year-round, the museum is open to 9:00 p.m. From June 26 through Labor Day the museum remains open until 9:00 p.m. on Wednesday, Friday, Saturday, and Sunday. Food service areas are open 11:00 a.m. to 4:00 p.m.

THE MUSEUM LIBRARY is open 9:00 a.m. to 4:00 p.m., Monday through Friday. Please obtain pass at reception desk, first floor north.

MUSEUM TELEPHONE: 922-9410

July/August
1976

Field Museum of Natural History Bulletin


N° 17
PLATE LXXXII
Whip-poor-will, CAPRIMULGUS VOCIFERUS. Wils. Male 1 Female 2,3. Black Oak or Quercitron. Quercus tinctoria

Field Museum of Natural History Bulletin

July/August, 1976
Vol. 47, No. 7

Editor/Designer: **David M. Walsten**
Production: **Oscar Anderson**
Calendar: **Nika Semkoff**
Staff photographer: **Ron Testa**

Field Museum of Natural History

Founded 1893

President and director: **E. Leland Webber**

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CONTENTS

3 **"Whip-poor-will,"** painting by John James Audubon, reproduced in Field Museum's four-volume elephant folio edition of *The Birds of America*

4 **Gemstones: Beware and Be Aware**
by Edward Olsen, curator of mineralogy

8 **Western Australian Field Program, 1976-77**
by Alan Solem, curator of invertebrates

10 **Our Environment**

14 **Field Briefs**

16 **Field Trips for Members**

18 **The Tribal Eye**
Film series on tribal societies

19 **July/August at Field Museum**
Calendar of coming events

COVER

"Whip-poor-will," painting by John James Audubon, reproduced in The Birds of America. *Photo by Ron Testa. See page 3.*

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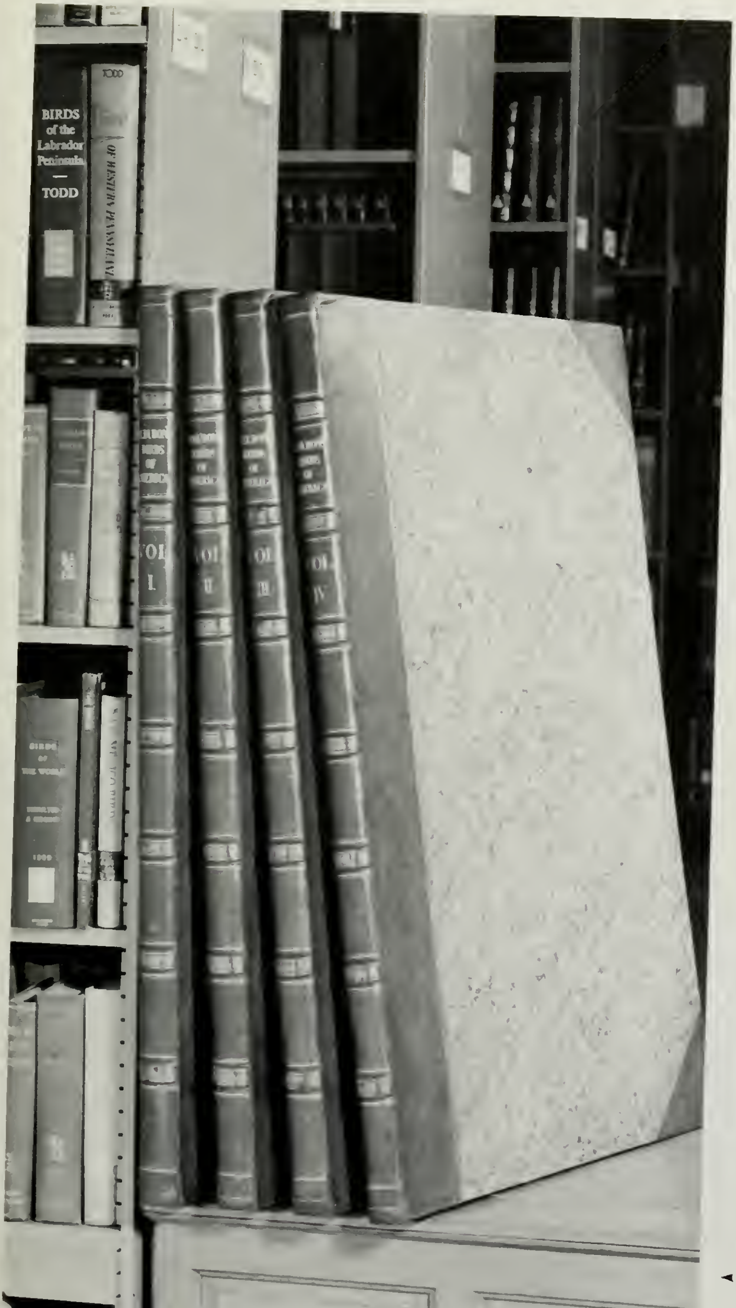

Courtesy of The American Library Association

"Whip-poor-will,"

by John James Audubon

(1785-1851), is the cover illustration for this month's *Bulletin*. It was executed between 1827 and 1830 and was first published as plate 218 in his *The Birds of America*, issued in London between 1827 and 1838.

The larger moth in the painting is a cecropia, *Hyalophora cecropia;* the smaller one an io, *Automeris io*. Both species are common in temperate North America. The foliage is of the red oak, *Quercus borealis* or of the black oak, *Q. velutina*.

This is a reduced reproduction of the plate (39.5 x 29.5 inches) in the four-volume elephant folio edition on display (one volume at a time) in the north lounge. The set was given to Field Museum in 1970 by Mrs. Clive Runnells.

This rare and beautiful work, one of the landmarks of American ornithology, consists of 87 parts of five hand-colored, copperplate engravings—435 illustrations in all. The Museum's set is of particular value because it is one of two existing sets enriched with an additional 13 plates and was originally the property of Euphemia Gifford, cousin and close friend of Audubon's wife, Lucy. Audubon himself, according to a letter addressed to Miss Gifford, took "satisfaction in attending to the colouring and finishing of each separate plate or engraving. . . ."

The illustrations were printed life-size; and Audubon acknowledged that "it renders the work rather bulky, but my heart was always bent on it, and I cannot refrain from attempting it." With this first "number" he was ready to seek subscriptions and issued his prospectus on March 17, 1827. From this time until 1839 he traveled between Europe and America, financing and overseeing the publication of *The Birds of America* and its text, titled *Ornithological Biography* (5 vols., 1831-39), and index, *A Synopsis of the Birds of North America* (1839). □

◄ *Field Museum's four-volume elephant folio edition of Audubon's* The Birds of America. *This photo was taken before the volumes were placed on permanent display in their air-conditioned case in the north lounge.*

GEMSTONES: Beware and Be Aware

By Edward Olsen

All gemstones are minerals, but not all minerals are gemstones. Therein lies a problem for a professional mineralogist, especially one at a large museum such as the Field Museum. Of the approximately 2,500 known minerals, only about 50 have ever been used as gems; and fewer than 15 of these comprise the most commonly owned gems. Now anyone would think that a professional mineralogist ought to be able to become pretty expert at spotting the identity of only 15 out of 2,500 different objects of his attention and training. Unfortunately this isn't true—not because nature has made these 15 more difficult to recognize, but rather because man has intervened to throw all sorts of distractions in his way.

Gems have monetary value, and if something is worth money, is in short supply, and in high demand, there is a strong incentive to cheat. The peculiar thing about gemstones is that there is acceptable cheating—and unacceptable cheating! The rules of the game are unusual to say the least.

It is a familiar sight at a museum such as ours for a well-dressed lady to arrive, carrying with her a box or bag of assorted jewelry. The reason for the visit is that she has already asked a jeweler to evaluate some inherited jewels, but the jeweler raised an eyebrow, casting some doubt on a stone's authenticity. And now she turns to the museum, hoping the staff mineralogist may reassure her of her jewel's worth. The jeweler, by necessity, has a commercial interest; but it occurs quite naturally to the lady that the museum, which isn't in the gemstone business and has "no ax to grind," might be able to give an unbiased identification. The reason she doubts the jeweler is very simple: how could the stone be a fake when it has been in the family for generations? "After all, it came from my grandparents!"

In spite of the fact that the Bible says men cheat men—and have been doing so for a long, long time—somehow it is assumed that only mid-20th century technology is capable of conniving in the gemstone industry with any kind of finesse. It usually comes as a shock that a stone, given to grandmother in the 19th century, could be a phony.

Men have, in fact, been faking gemstones for millenia. Pliny the Elder, who lived from AD 23 to 79, wrote eloquent warnings to Romans about the use of glass imitations. The Egyptians learned to manufacture glass and to color it with various mineral pigments. They began making imitation emeralds, turquois, lapis lazuli, and jasper—all this as far back as Egypt's 19th Dynasty, 1587-1328 BC! Artificial dyeing of gems, the changing or enhancement of colors, the making of doublets and reconstituted gems, goes back centuries; the origins in time are not known. To be sure, the inventor of any process that improves something of little value to a condition where it's worth more is certainly going to keep it a secret. Historians have no problem in establishing the date when Watt made the first steam engine, Archimedes the first simple water pump, and Newton learned that, statistically, apples almost never fall up; but the quiet genius who first discovered that the gentle heating of pale green beryl crystals turned them a divine aquamarine blue is not recorded. His name is more likely to appear in a bankbook than in a history book.

Let's take a look at what the present gemstone industry regards as acceptable imitations. *Synthetic* gemstones are *real* gemstones, not fakes. That is, they are exactly like their natural counterparts except in point of origin: Synthetic stones are made by man and natural ones are made by nature. Mineralogically, chemically, virtually in every characteristic, they are identical. A synthetic ruby, for example, *is* a ruby—one made by man. None of the standard mineralogical tests can distinguish a synthetic ruby from a natural one. Major jewelers, with decades of experience, cannot tell them apart. In recent years the number of gemstones that are being synthesized has increased; ruby, topaz, sapphire, star sapphire, emerald, and diamond can now be made by man. But some gemstones, topaz for example, are not commercially synthesized, simply because the demand for topaz is low and the supply of natural stones is more than adequate.

Rubies and sapphires, on the other hand, are more popular and these stones are produced commercially on a large scale. The major problem for the consumer is that there is generally no way of telling if the ruby ring offered for sale contains a natural stone (which by and large has more intrinsic and monetary value) or if it is synthetic. Occasionally it is possible to recognize a synthetic stone simply because it is so flawless. Natural stones

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Edward Olsen is curator of mineralogy and chairman of the Department of Geology.

sometimes contain minor flaws or irregularities, but when man makes a synthetic it's perfect or he doesn't market it.

A real problem with the synthetics is that they are relatively inexpensive to produce and, as a consequence, are available just about anywhere. American tourists buy jewelry in places like India, Hong Kong, and Sri Lanka (formerly called Ceylon). While the settings are genuine native work, the stones set in them these days are more often synthetics that are manufactured in the United States and then sent to be cut and polished in countries where labor costs are lower. The tourist assumes the stones are natural and of local origin, and pays accordingly.

Man also synthesizes stones that seldom occur in nature in gem quality, or never occur in nature at all. Rutile is a mineral that does occur naturally, but is rarely of gem quality. Synthetic rutile is sold under the names "titania" or "Kenya stone." It has a brilliancy and display of flashing colors that outshines the best diamonds. It is easily recognized, and respectable American jewelers never attempt to sell it as diamond. Similarly, there is a synthetic stone called "YAG" (yttrium-aluminum-garnet) that does not occur naturally. This stone has many of the optical properties of the best diamonds, and to the unwary buyer could easily pass for diamond. It is, however, sold as a synthetic under its proper name here in the United States. Elsewhere in the world there is no guarantee that dealers are so scrupulous.

The heat treatment of natural gemstones has been going on for centuries. The color of certain stones, with gentle heating, will change and sometimes be improved. Yellow topaz may turn to a rose-red; blotchy amethysts may become uniform in hue; strongly heated amethysts turn a brownish-yellow; heated carnelians turn red; yellowish zircon may turn colorless or blue-white and take on the brilliancy of diamond; sapphire may become colorless and, when properly faceted, pass for diamond. Light green beryl may turn to blue aquamarine; gray zoisite may turn a deep blue, becoming what is then called tanzanite.

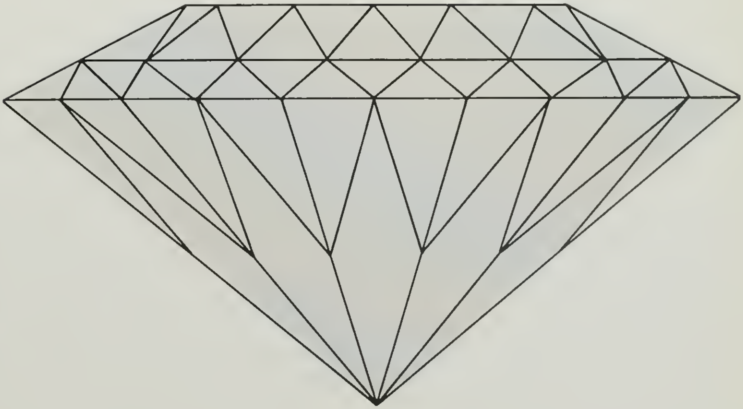
Not all stones, however, change color. For example, most green beryl crystals remain green when heated. But heat-treated stones are considered quite acceptable in the gem trade. As a matter of practice, most mines which extract gems that are known to improve their color by heating will routinely heat-treat all gems they mine, taking advantage of whatever improvements they can get, and selling the unchanged stones for lesser values.

In recent years the *irradiation* of certain gemstones has become an acceptable practice. In this process stones of gem clarity are exposed to radioactive particle bombardment, principally by neutrons and gamma rays. White diamonds may be turned various shades of green, plain quartz may turn to a smoky color, and topaz may turn a sherry brown. While most of these changes are permanent, others are only temporary. Some irradiation-colored stones will, in time, fade back to their original colorless state, especially if exposed to sunlight or to fluorescent lights such as those found in home lighting fixtures. Irradiated stones, especially diamonds, are so identified when sold. There are instances of gemstones other than diamonds not being labeled as such, and large sums of money have been lost as the color of the purchased gems faded completely.

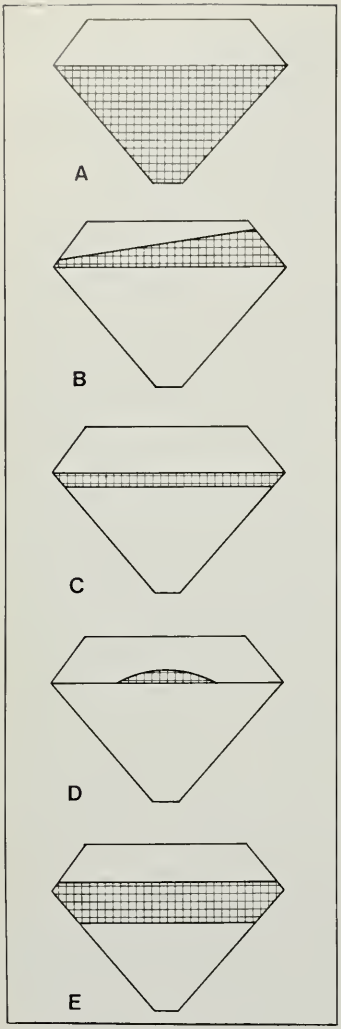
In addition to these generally accepted practices there are certain fraudulent ones, on which the legitimate gem industry frowns, but over which it has little control. Technically, the easiest of these practices is the manufacture of colored glass imitations of gemstones, commonly called "paste"; but the eye of an experienced jeweler can usually spot such imitations with ease. There are also several optical devices in use by gemologists that can easily detect glass imitations.

A common misconception is that all glass is pretty much the same; but the word "glass" is a generic word, like "automobile." Just as there are big differences in quality among different kinds of automobiles, so too there are big differences between different kinds of glass. There are lime glasses, soda glasses, barium glasses, lead glasses, and so on. The old test of scratching a windowpane with a diamond ring to prove it is indeed a diamond really doesn't prove anything. Many imitation glass "diamonds" are made from types of glass that easily scratch the softer window glass.

Fradulent synthetic stones may currently be found on the market. These are not glasses but actual synthetic minerals. The falsehood lies in the fact that they are marketed under incorrect names. The best example of this is the synthetic mineral corundum, which can be synthesized to have the same optical and color properties of alexandrite, a very rare gemstone. Co-



Typical cut gemstone *viewed from the side. The top portion is the* crown*; the lower portion is the* pavilion*. The edge dividing them is the* girdle.



Partially Synthetic Gemstones: Doublet and Triplet Construction. (A) Typical doublet with a crown of real gemstone and a pavilion (lower part, crosshatched) of inferior material. (B) Doublet in which only the top portion of the crown is of real gemstone. The remainder of the crown and all of the pavilion are of inferior material. (C) Typical triplet with a crown and pavilion of inferior material and a thin plate of genuine gemstone sandwiched in between. (D) Unusual triplet made of a crown and a pavilion of inferior materials. The crown has been hollowed out and filled with a colored liquid to give color to the whole piece. (E) Triplet with most of the crown and most of the pavilion of inferior material; a fairly thick layer of genuine gemstone lies between.

rundum stones are sold as "synthetic alexandrite"; however, alexandrite is, mineralogically and chemically, entirely different from corundum. A truly synthetic alexandrite is not available commercially.

Among the most ingenious of the fraudulent gem-making schemes is the fashioning of *doublet* cut stones. For example, a true, natural ruby might be cut to form the top part, or crown, of a stone for a ring. The bottom, or pavilion, of the stone is cut from some cheap material such as quartz, red glass, or garnet, and the bottom is then melted (fused) or simply glued to the top. The whole stone is then set into a ring with a metal setting that recesses the stone so that it can be viewed only from the top, or with just a side view of only the crown. The ring might then be sold as, say, a 6-carat ruby and in reality contain only 2 or 3 carats of genuine ruby! A similar fake is the triplet stone—a faceted stone in which both the crown and the pavilion are made of some worthless material. Sandwiched between these is a thin layer of the actual gem material, or perhaps only a layer of colored glass or even plastic. Set into jewelry so that it can only be viewed from the top, such a triple-layered stone appears to be one stone of uniform color.

Besides these methods of obvious fakery, there are more subtle methods. A certain gemstone may have very weak color, but after faceting the color may be artifically "improved." For example, a pale red ruby, which is worth relatively little, may get a red paint job on the pavilion, so when it is viewed from the top, set into a piece of jewelry, it will appear dark red. Similarly, a pale sherry-colored topaz can be "improved" by painting gold gilt on the pavilion or backing it with gold foil. Pale yellow diamonds are worth less than clear ones—so-called white diamonds. By painting the pavilion of a yellowish diamond with a light violet color, the stone, viewed from above, will appear white. The violet cancels out the yellow tinge.

In all these cases—doublets, triplets, and stones with painted pavilions—the setting invariably has a metal layer on the underside so that the pavilion of the stone cannot be viewed from below. When a stone has a setting with such a metal layer it is wise to be cautious—it may be hiding something.

Most agate that is sold has been "improved" in a different way. Because agate is slightly porous it can be penetrated by various dyes. Most of the brightly colored agates sold today have been artificially dyed. Similarly, the current demand for turquois has been met by imitation materials. One such false turquois is another slightly porous mineral called howlite, which has most of the physical properties of turquois (hardness, density, etc.); in addition, it absorbs a beautiful blue dye. Howlite is thus sold as imitation turquois. It is, however, so much like real turquois that it can be easily sold as the real thing. Similarly, much common turquois is only very pale green or pale blue, even yellowish; so it is quite common today for poor quality turquois to be dyed a lovely blue, increasing its value severalfold. Such dyed turquois can easily pass most of the standard tests a mineralogist can perform on it.

Probably the most recent entrant into the fake gem market is in the family of modern *plastics*. Since around 1900, when plastics first appeared, the numbers and kinds have increased. Today plastic imitations are marketed in jewelry, especially for amber and turquois.

What can the gem and jewelry purchaser do to be reasonably certain he or she is getting authentic material? The first rule is to buy from a reputable jeweler, one who will stand behind what he sells. The purchaser should always obtain a receipt describing the item and the stones in

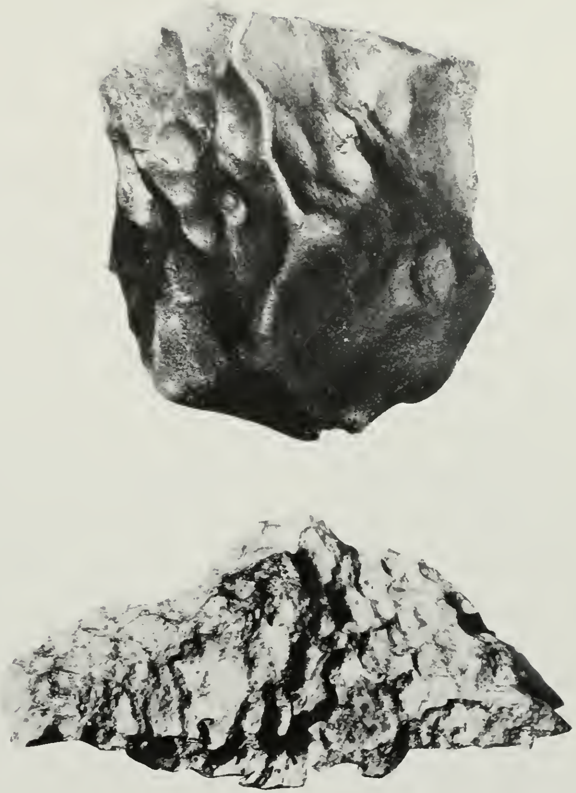
Rough boules and faceted stones of synthetic padparadscha sapphire (above) and of synthetic blue spinel (below). These and other synthetic gemstones are on view in a special display in the Gem Room (Hall 31).

it. Reputable jewelers are usually (but not always) members of a self-regulatory association such as the National Retail Jewelers Association or the American Gem Society.

Another consideration is that if you are purchasing an expensive stone, buy it as an unset stone and have it placed in a setting of your choice. That way you get to see the "naked" stone and can view it from all angles for clarity, uniformity of color, freedom from serious flaws, and so forth. If you prefer a piece of jewelry that is already in a setting be cautious if, below the stone, the setting has a metal layer, preventing its being viewed from below.

When traveling in known gem-producing countries, such as Sri Lanka or Brazil, do not think you can walk into bargain prices. Mine owners, miners, and mineral dealers in these countries are fully aware of the prices you'd pay back home, and will charge all they can get. The only bargains you might get are synthetic stones, glass imitations, or natural stones being sold under incorrect names. In addition, you may find that although you seem to be getting a bargain price on a good stone, local and provincial taxes, duties, and "gratuities" can bring the price up to normal market values or beyond. Also, there is no reason to assume that the country where a gem or piece of jewelry is purchased is necessarily the country of origin. Stones are frequently sent from the country of origin to another country for cutting, polishing, or setting into jewelry. Brazilian smoky quartz goes to Europe, American synthetic rubies and sapphires go to India, and American and Australian jade goes to Hong Kong and Taiwan.

For the unwary gem and jewelry buyer, the traps are numerous. Even experts are hoodwinked on occasion, and this has been going on for centuries. If you inherit a piece of jewelry from your grandparents, and you like it, wear it in good spirit and enjoy it. The fact that it came from grandmother is not necessarily a guarantee it is entirely genuine. In the case of very expensive purchases, if you have any doubts, a reputable jeweler will not object to your submitting it to the Gemological Institute of America (laboratories in New York City and Los Angeles) for a certificate of authenticity. Their tests cost a little extra but the trouble can be well worth it. If this is done, it is then wise to keep the certificate in a safe place so that some day your granddaughter can say, with confidence, "It came from my grandparents." □



Typical meteorites: *The specimen at top is of stone and is about 4½ inches wide. The specimen below—about 30 inches wide—shows characteristic surface features of an iron meteorite.*

The Great Meteorite Hunt: $100 Reward!

A newly discovered meteorite could be worth $100 to the lucky finder. The Field Museum's Department of Geology will award this amount to anyone for a specimen that can be authenticated and recovered by the Museum for scientific studies.

Meteorites are solid bodies that have fallen to earth from outer space, probably from small planets (asteroids) whose orbits are located between the orbits of Mars and Jupiter. They are generally recognized by their unusually heavy weight compared to ordinary rocks of the same size. A stone meteorite weighs about half again as much as an ordinary rock of the same size, and an iron meteorite weighs about three and a half times as much as an ordinary rock. Some meteorites have a metallic appearance and are magnetic. Many have black or dark-brown crusts—thin coatings formed by frictional heating of the surface during entry into Earth's atmosphere.

If you know of an object which you suspect to be a meteorite, contact Paul Sipiera, c/o Department of Geology, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, Ill. 60605. Free tests will be made on your specimen to determine if it is an actual meteorite. A fact sheet that shows how to identify meteorites is available from Mr. Sipiera on request: please enclose a long self-addressed stamped envelope (No. 10 size). Only new finds qualify for the $100 reward. No purchased specimens qualify. There is no closing date for the hunt. □

Western Australian Field Program, 1976-77

By Alan Solem

The Western Australian Field Program, the largest and most complex collecting expedition undertaken by Field Museum of Natural History since the Philippine Zoological Expedition of 1946, was announced at a press conference on May 4. In cooperation with the Western Australian Museum, Perth, ten to fifteen representatives of Field Museum will investigate aspects of the biology and geology of both the Kimberley region in northwest Australia and southern coastal areas of that great continent, which is about the size of the contiguous 48 states and has an equal variety of habitats (see map). A small mountain of specimen containers, collecting gear, generators, field clothes, medical supplies, and camping equipment have already started on their way by ocean freight. Purchase orders for three land rovers equipped to traverse rough country have winged their way to Perth.

The culmination of two years of plans, dreams, crises, challenges, trivial decisions, grand ideas, and detailed research preparations occurs this fall, as the expedition members jet their way to Australia. There will not be a group departure with a fanfare. One or two at a time, we will clear our desks for mail to accumulate, leave instructions for our staffs, and board planes at O'Hare. Then our parts of the field program begin. Jet age travel allows almost precise timing of arrivals and departures. This eliminates the long shipboard journeys of earlier years and the need for a group departure.

At the time this was written, we knew that mammalogists, malacologists, a world authority on ectoparasites of vertebrates, an acarologist, and a bryologist—all assembled from Field Museum staff, associates, renowned specialists, and graduate students—would depart for Perth. If attempts at fund-raising still underway prove successful, then workers on fossil mammals and various marine organisms also will travel to Australia for additional field activities. We will be joined in the field for brief to more extended periods by staff from the Western Australian Museum.

These diverse interests and areas of expertise are focused primarily on the Kimberley area of northwest Australia lying between Broome and Darwin. This region has been dry land and was never glaciated during perhaps the last 500,000,000 years. Until 125,000,000 years ago the Kimberley was an isolated corner of the great southern continent, Gondwanaland. About that time Gondwanaland broke up into several large pieces (India, Africa, Madagascar, South America, Antarctica, Australia). Australia slowly drifted north to its present position, colliding with parts of Indonesia and New Guinea. Starting in the last few million years, the northern coastal fringes of Australia have received an invasion of wet-adapted animals and plants whose ancestors came from southeast Asia and Indonesia, but the interior regions may have been semiarid or desert for at least 75,000,000 years. Because the Kimberley is so isolated and difficult of access, still mostly uninhabited, and not yet exploited economically, even basic collecting surveys have not been made.

We will find hundreds of new species of arthropods, more than a hundred new species of land snails, a number of new bryophytes, and possibly some new mammals. But the main focus of our work is not to find "new" species. We want to understand the distribution and something of the ecology of organisms in an area that has not yet been exposed to massive development by man. Undoubtedly we will discover or locate species that could be endangered by coming development. In this respect the results of our work will help the Australian national and state governments to protect the rarest and most endangered of the Kimberley biota.

The ideas that are generated during our collecting and observations will affect the subsequent research efforts and thoughts of all participants. The interactions between specialists in different disciplines will be numerous, intensive and, from our present vantage point, unpredictable. For example, when a specialist in land snails, one on liverworts, and one on mites all start poking into the same rock crevices and shaded nooks, discussing the factors that influence "their" organisms, all three will benefit in a way that lunchtime discussions in Chicago never can duplicate. The intellectual value of this combined effort far exceeds the value of individual trips to the same region.

Equally important, the areas to be worked mostly are remote, difficult of access, and quite dangerous to the lone traveler. With two or three land rovers we can penetrate areas that one vehicle would not dare enter. By sharing vehicle use, costs are lowered. By sharing a base camp at Beverley Springs cattle station (see map), about 2,000 miles north of Perth, we have a supply and specimen storage center from which the field parties can radiate on ten-to-fourteen-day collecting transects. "Corner grocery shopping" does not exist in the Kimberley, so we must carry or warehouse our food and fuel supplies. We also must be prepared for minor medical problems, although the Australian flying doctor service could be contacted for major emergencies. American Hospital Supply Corporation, of Evanston, Ill., is donating all medical supplies needed for the expedition members.

Portions of the field program are starting at different times. The first group going into the field will be the mammal party, primarily funded and led by Mr. and Mrs. William S. Street, field associates of Field Museum of Natural History who have led several previous mammal-collecting expeditions to Alaska, Peru, and the Middle East. They will be joined by Ms. Laurel E. Keller, graduate in mammalogy from Oregon State University, Dr. Fritz Lukoschus of the Catholic University, Nijmegen, Netherlands (a world authority on certain skin and fur ectoparasites of vertebrates), and a second field assistant in mammalogy, either from the United States or Australia.

Alan Solem is curator of invertebrates.

From August through November they will be collecting in the Kimberley area, concentrating on the semiarid inland regions rather than the scattered rain forest patches near the coast that have been the target for previous collecting efforts by Australian and American mammalogists.

Late in August I will leave for Perth and, in mid-September, be joined by John Kethley, associate curator of insects at Field Museum. We will start north by land rover, collecting as we go, from places which I visited in early 1974, then join the mammal party in mid-October. In November, two malacologists, Field Associate Mr. Laurie Price from New Zealand, and a graduate student from the University of Arizona, will join Kethley and myself. The first rains should hit the Kimberley during the early part of December. Shortly after this Kethley and I will return to Perth, with the others remaining in the Kimberley to study aspects of snail ecology during the wet season. The land snail work, which embraces both a survey of what lives where and studies on ecological interactions between closely related species, has been funded by a three-year grant from the National Science Foundation. From late January through March, I will work in Perth, dissecting the material collected to find seasonal variations in anatomy and to identify places where probable intense interactions between species are occurring. For this phase of the work, I will be joined by scientific illustrator Elizabeth Liebman. When the rains end about late March, I will return to the field with the students for another six weeks in the Kimberley. We will all return to Perth to pack and ship the collections, and then begin a collecting trip east to Adelaide and on up to Alice Springs in central Australia. Late in June, 1977, I will return to Chicago.

John Kethley will be surveying the litter arthropod fauna from many of the same sites from which snails are being collected, making general insect collections, and paying particular attention to a very primitive group of free-living soil mites and to certain mites that live on millipedes. Initially Kethley and I will share a land rover, but early in January he will join forces with John Engel, assistant curator of bryology at Field Museum, for a survey of first the humid southwest parts of Australia and then a more extensive survey of Tasmania, with some collecting in the state of Victoria, in southeastern Australia. This work is being funded by Field Museum and the Kroc Environmental Fund.

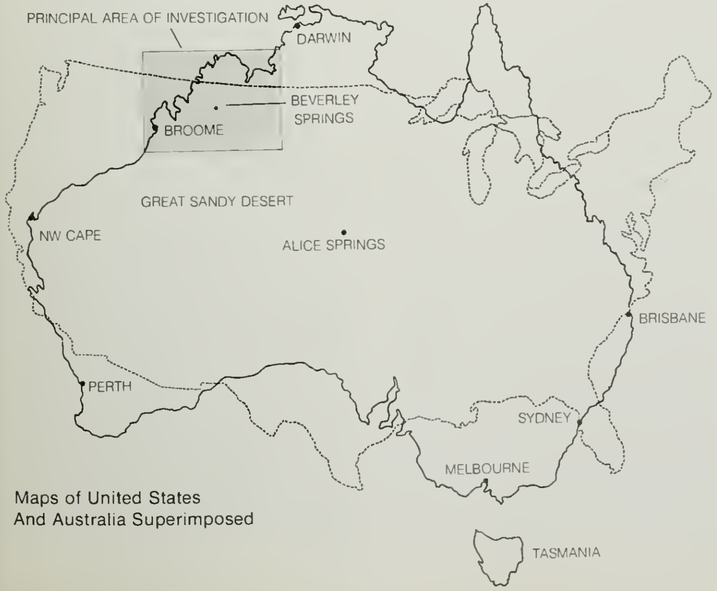
John Engel will fly first to Tasmania in late November for some early summer (Australian season) field work, then over to Perth about January 1. His main effort will be towards an ecological and systematic survey of Tasmanian bryophytes, which has been funded by a grant from the National Science Foundation. Engel, Kethley, and I will join forces for a survey of humid regions and areas east of Perth, then Kethley and Engel will continue east, returning to Tasmania for intensive sampling, and then collecting in Victoria. Kethley will return to Chicago late in March, and Engel in April or May.

William Turnbull, curator of fossil mammals, together with Ernst Lundelius of the University of Texas, are attempting to raise money for fossil mammal-collecting in the Pilbara and Canning Basin areas just south of the Kimberley. No Tertiary mammal record exists for northwest Australia, and discovery of fossils would give much insight into the evolution of Australia's unique mammalian fauna. Several of the Field Museum and Western Australian Museum staff are trying to fund a period of marine collecting in the Bonaparte and Buccaneer archipelagoes, off the northwest coast of Australia, from April through June 1977, following the end of the cyclone season. Vital to the success of this portion of the field program is obtaining a suitable ocean-going vessel. Up to fifteen scientists, students, and skilled collectors would be collecting land and marine organisms from these offshore islands.

In summary, the Field Museum of Natural History and the Western Australian Museum in Perth are cooperating to partly survey one of the last large unsampled land areas left on earth—the Kimberley block of Australia. The collecting itself will be important, but the ideas generated and the problems attacked by this work will form the intellectual basis for years of work by scientists throughout the world. Scientists in Europe, North America, Australasia, and Japan will share in study of these collections. All type specimens of new species will be deposited in Australia, together with a share of the general collections. These will be immediately and conveniently available for future use by Australian workers who monitor changes in the Kimberley area as exploitation changes the environment.

Our preliminary surveys will point out areas that need further exploration by others, will review biological problems of interest, and make possible many advances in our knowledge of the systematics, ecology, and evolution of organisms from the southern lands. Behind the glamour of "expedition" and "remote areas" lie the varied purposes and cooperative needs of many scientists.

We're off to Australia soon. Reports from the field will keep you informed of our problems and progress "down under." ☐



Maps of United States And Australia Superimposed

Our Environment

Snails: Sensitive Indicators of Man's Environmental Impact

In early 1973, Alan Solem, curator of invertebrates, was asked by the Office of Endangered Species (OES) to survey the land snails of eastern North America in order to determine which species were in imminent danger of extinction or whose existence was restricted to such a small area that they could easily be wiped out by collectors or developmental activities. Although more than 350 land snails are known from this area, checking all these species and varieties was neither possible nor necessary, since most are widely distributed and common.

Museum study and search of the literature resulted in Solem identifying 48 species or races as being potentially endangered. Field inspections with contract support made it possible to identify six as being immediately endangered, seven as potentially endangered, and six as in no danger. The remaining snails, located mostly in national parks, could not be investigated within support limits. Dissection and study of several little known species investigated during this work subsequently resulted in technical reports in *The Nautilus*, a leading malacological journal, as well as the formal recommendations to the OES that led to the listing of 11 of these snails among a total of 32 proposed as endangered or threatened. Solem is continuing work on developing means to preserve several threatened midwestern land snails.

The OES proposal to list these species appeared in the April 27, 1976, issue of the *Federal Register* (pp. 17742-7), with 15 snail species listed as endangered, 17 as threatened. Other proposals are expected to follow as surveys are completed on the more than 2,000 different species of land and freshwater snails found in the continental United States. Scientists estimate that as many as 20 percent of these species may be found to be endangered or threatened.

The "endangered" proposals involve species which are restricted to a very small area or those that now occur in such small numbers as to be in immediate danger of extinction. The "threatened" proposals are for species that occur over a wider range or in larger numbers, and that face a less imminent threat over most of their range.

A determination that any of these species are threatened or endangered will provide them with legal protection from collectors, and will require federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued survival of the species.

The value of snails as indexes of man's impact on the environment is far greater than that of most larger animals listed as threatened or endangered, such as the timber wolf and the mountain lion. Snails are extremely sensitive indicators of pollution levels. If the continued existence of land and freshwater snails can be assured, then they provide a way to assess the current health of the entire ecosystem. This enables man, who also is dependent upon healthy ecosystems for his continued well-being, to better guide his destiny. Land snails are particularly significant in the cycle of reducing dead plants back to chemicals, and freshwater snails are, in addition, important in the fish world's food chain.

Snails also may have unexpected health benefits for man. Recently, a substance called mercenene has been found in clams which some investigators believe could be an effective weapon against cancer. Snails and other mollusks rarely get cancer, and chemical zoologists suspect that mercenene may be responsible for the metabolic and biological defenses which certain mollusks have against cancer. Mercenene and similar substances are believed to be present in other mollusks, including snails. In laboratory tests mercenene has inhibited the growth of certain cancers in mice, and it has demonstrated no side effects on human tissue, say the researchers. In addition to these properties, research on snails also has shown them to be remarkable organisms whose systems can produce a wide variety of poisons, antibiotics, tranquilizers, antispasmodics, and antiseptic chemicals.

Lodged in one place and often restricted in food source and movement, the land snail species that have survived to the present day are remarkable for their abilities to adapt to natural environmental changes such as fires, floods, or climatic changes; but they cannot cope with acid mine wastes, municipal wastes, soil runoff, pesticides, and other man-caused threats to their existence.

Interior Official Supports PCB Ban

"PCB residues have been found in fish samples from all major river systems throughout the United States, and in most of the bird samples taken since 1970. PCBs are literally everywhere." That is the assessment of PCB distribution given by Assistant Interior Secretary Nathanial P. Reed, who recently testified before a House Committee.

"The ubiquity of PCBs in our environment looms as a dark cloud casting an ominous shadow upon all of our living natural resources which depend on a clean and healthy environment," Reed said. "With more than one-third of the U.S. population living near the Great Lakes, and a majority of the population residing about other waterways, we must be cognizant of the potential impact of the tons upon tons of PCB-infested materials which are daily deposited into these waters from industrial and domestic sewage effluents, landfills, waste incineration, runoff from materials deposited in the soil and from atmospheric fallout...."

Reed said PCBs posed an immediate threat to efforts to preserve and protect threatened and endangered species. He said under present conditions, "PCBs may very well be the deciding factor in the survival of some species in spite of our best efforts for preservation." Reed noted that success in controlling the sea lamprey in the Great Lakes has been for naught because the fish cannot be eaten because of PCB contamination. He said the pollutant represented another environment stress on the canvasback duck because it feeds heavily on fingernail clams which concentrate PCBs at inordinately high levels.

Reed concluded, "I support a national

ban on all domestic and imported PCBs. We must have as our goal the elimination of PCBs from the environment of the U.S. as rapidly as possible."

Vandalism on Natural Resource Lands

Vandalism is a great and growing problem on the national resource lands administered by the U.S. Bureau of Land Management. Much of the senseless damage is being done to lands and resources as well as to facilities such as campgrounds, toilets, and signs.

Motorcyclists have torn up an ancient Indian intaglio in the Yuha Desert of Southern California, "pot hunters" have looted and destroyed artifacts of the Anasazi culture in southwestern Colorado, petroglyphs have been stolen by commercial black market operators and souvenir hunters, vandals in Nevada destroyed a delicate recorder used to monitor ponds containing three nearly extinct species of desert fish, desert tortoises in several states have been smashed by off-road vehicles or collected by people wanting a free pet: these are a few examples.

Natural resource lands comprise about one-fifth of the total U.S. land area. Yet the Bureau of Land Management, which is responsible for those lands, does not have law enforcement authority to stop the destruction. The BLM Organic Act, passed by the Senate and now before the House, would give the agency enforcement authority.

Federal Judge Dismisses Wolf Case

The U.S. District Court for the District of Columbia has dismissed a suit which sought to require the Interior Department to prepare an environmental impact statement on a wolf research and control project proposed by the State of Alaska. The Alaska Department of Fish and Game had proposed to remove about 100 wolves from a relatively small area of about 3.3 million acres near Fairbanks (Alaska totals more than 375 million acres) to stimulate moose survival and learn the effects of the control measure on wolf and moose populations. Since the Department of Fish and Game was established in 1960 when Alaska became a state, the wolf population has grown to a historic high under improved management programs.

The preservationists charged that the program constituted a major federal action which would have a significant effect on the human environment. They requested that an environmental impact statement be prepared. Interior refused, saying that the proposal was not a federal action even though a small percentage of the area was federal land managed by the Bureau of Land Management.

John E. Crawford, chief of BLM's Wildlife Division, pointed out in an affidavit that "the state has jurisdiction over the management of wildlife on public lands and BLM has responsibility for the management of habitat on BLM lands." The judge subsequently ruled that no federal action is involved.

Dead Eagle Was Chemical Garbage Can

A bald eagle found dead last year on the shore of Cass Lake, Minn., was a victim of pesticide poisoning, report U.S. Fish and Wildlife Service biologists. The remains of the adult male bird were examined at the FWS Patuxent Wildlife Research Center, Laurel, Md.

Chemical analyses of the eagle's brain and carcass revealed the eagle had been exposed to a wide assortment of highly toxic organochlorine insecticides and industrial chemicals. Brain residue levels of pollutants often are diagnostic in determining cause of death.

The brain contained 7.5 parts per million dieldrin, a long-lived insecticide which until recently was widely used against corn rootworm. Brain levels above 4 or 5 parts per million are considered lethal to birds.

Other insecticides found in the dead eagle's brain included DDT, along with DDE and DDD, which are breakdown products of DDT; heptachlor epoxide; chlordane isomers; mirex; toxaphene; and hexachlorobenzene.

PCB s—DDT-like substances of grave concern to environmentalists—also were discovered at 88 parts per million in the brain. The rest of the body contained the same residues as the brain and in higher amounts.

"The presence of sublethal amounts of DDE in the eagle body is significant and disturbing," says J. B. Elder, an FWS environmental contaminants specialist. The Cass Lake eagle was found within one mile of an active nest that has been under observation for 12 years by forest service biologists. "During this 12-year period, no young eagles were fledged from the nest," reports Elder. "If the male eagle was one of the mated pair, it is probable that the female also carries a high body burden of DDE and other pesticides." DDE is known to cause thin-shelled, often infertile eggs. The substance could be responsible for the unsuccessful hatching record of the Cass Lake pair.

The insecticides and other pollutants found in the eagle are fat soluble compounds. Birds and other animals often carry high residue levels in body fat without apparent harm to the individual. During periods of stress—such as migration, nesting, or food shortages—fat reserves are withdrawn. When this occurs, the stored insecticide is mobilized in the blood and may reach lethal levels before the excess can be metabolized and excreted. Thus birds may die, as did the Cass Lake eagle, many months after contamination and hundreds of miles from the source.

Among the contaminants present in the Cass Lake eagle, only PCB s are present in significant amounts in Minnesota environments. Although the eagle died in Minnesota, the use of DDT, dieldrin, heptachlor, and toxaphene has been restricted in the state since 1970 and "background levels" are low.

DDT and dieldrin now are under nationwide restriction; however, they were used heavily in other states long after Minnesota restrictions went into effect. The later and heavier use in other regions is reflected in continued high residues in aquatic environments and fish.

Reintroduced Fisher Thrives in W. Virginia

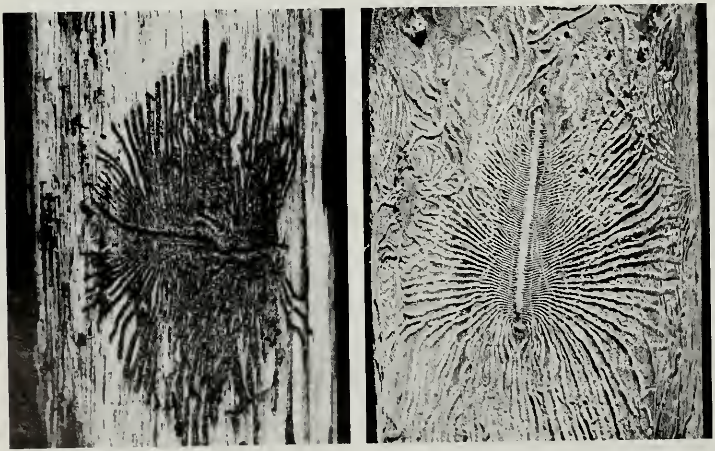
The fisher, a member of the weasel family, has been reintroduced and is surviving in West Virginia. The Wildlife Management Institute reintroduced the fisher in 1969 after trading New Hampshire wild turkeys for 23 of the little furbearers.

The institute has determined that the fishers are reproducing and have occupied approximately 2,000 square miles in the state. The animal has been seen mostly in high mountain areas and has added a new dimension to the expectations of backcountry travelers who want to see one of the "black cats."

Biologists say there are probably no more than 200 fishers in the state so far, but they are unable to predict what will happen in future years. They do not think the animal will reach densities found in northern states because West Virginia is on the southern fringe of the fisher's natural range.

OUR ENVIRONMENT...

Greatly enlarged, stylized model of Dutch elm bark beetle. (Actual specimens are about half the size of a match head.) The model was made in 1956 for the Museum's Dutch elm disease exhibit, now in temporary storage. The model-maker was Sam Grove, former artist-preparator at the Museum.



Egg galleries and larval tunnels of the Dutch elm bark beetle. The photo at left is of a gallery and tunnels of Hylurgopinus rufipes, *the native bark beetle; the specimen at right shows a gallery and tunnels of* Scolytus multistriatus, *the European elm bark beetle. The gallery of* Hylurgopinus *is characteristically horizontal to the ground, that of* Scolytus *is vertical. The galleries occur on the wood surface of the trunk and may be found by peeling away the bark.*

"Magic Bullet" for Dutch Elm Disease?

Du Pont has just come out with a fungicide, Lignasan BLP, which "promises control of Dutch elm disease," according to Elm Research Institute, an independent, nonprofit organization located in Harrisville, N.H. Arborists, home-owners, and park supervisors have been looking desperately for a cure for the disease since it first appeared in the United States in the early 1930s.

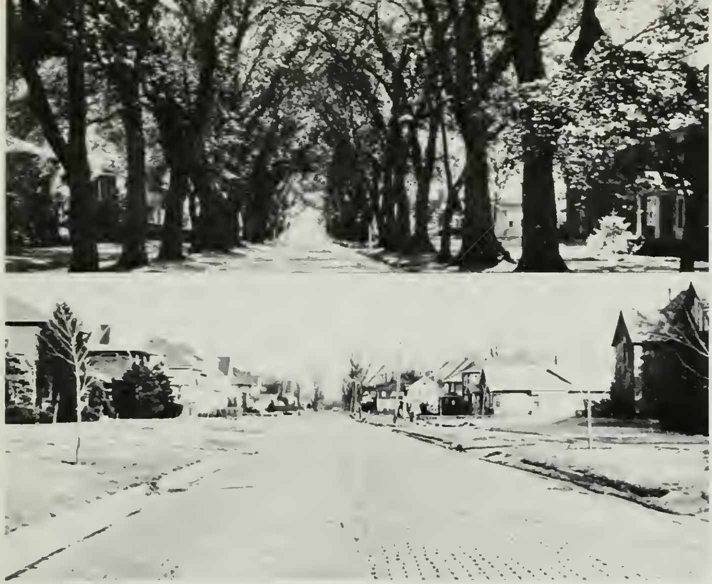
Once a tree is infected with the fungus *Ceratocystis ulmi* it is doomed, unless treated. A great variety of chemicals have been used against the fungus and its vectors, or carriers—the European elm bark beetle *(Scolytis multistriatus)* and its close relative, the native elm bark beetle *(Hylurgopinus rufipes);* but the prevention capabilities and cure rate of these chemicals have been uniformly poor, and some of the fungicides and insecticides are so highly toxic to man that their use, in any case, was impractical.

So elms in some areas have been slaughtered by the beetle-fungus team. In Champagne-Urbana, Ill., 20,000 elms were killed in 11 years; only about 100 trees survived the disaster.

Although elm owners have had their hopes up before, there now seems to be a basis for optimism with Lignasan BLP. It is a water-soluble liquid with a single active ingredient: methyl 2-benzimidazolecarbamate phosphate (0.7% solution). Du Pont prescribes it as "a protective treatment for uninfected trees and as a therapeutic treatment at first sign of disease in infected trees." The Environmental Protection Agency has now approved its use. The fungicide is available to trained arborists and others trained in the identification of Dutch elm disease and injection techniques. The Chicago-area distributor is Permalawn, Inc., of Evanston.

Lignasan BLP is injected into holes drilled into the tree's base, two gallons for each four inches of tree diameter. Treatment may be made at any time during the growing season, but is recommended for spring application when trees are in the half-to-full-leaf stage. Treatment after damage to the tree's crown exceeds 5 percent may not be effective, says the manufacturer.

In studies conducted by the Elm Research Institute in 33 states, the following results were obtained: Of 785 healthy trees injected with Lignasan BLP, one became infected with Dutch elm disease; of 785 healthy trees not injected, 303 be-



View along a residential boulevard in Champagne-Urbana, Ill., before and after the community was devastated by Duth elm disease.

came infected and 117 died; of 250 infected trees treated, 29 died; of 250 infected trees not treated, 177 died.

Mexican Wolf Barely Holding Its Own

Only about 200 Mexican wolves—the smallest of the timber wolf clan in North America—are estimated to exist in widely scattered packs in the high country of Mexico and perhaps the southwestern United States—areas currently subject to intensive human pressure.

The animal originally ranged from southern Arizona to west Texas and throughout the northern part of Mexico except Baja California and the coastal lowlands. Although they were essentially eliminated from the United States many years ago, Mexican wolves regularly crossed the border into Arizona and New Mexico through the early 1950s. Today, north of the border the species is a rare wanderer.

This wolf is protected by national law in Mexico and cannot be taken lawfully except by special permit issued by the federal director general of wildlife, but the regulation is difficult to enforce and not generally applied. In Arizona it has been protected by regulation, but it has received no legal protection in Texas or New Mexico.

As recently as 1944 the animals still occurred over the greater part of their original range in Mexico, and little effort had been made by the Mexican people to eliminate them. With the sale by lumber companies of extensive tracts of land to cattle ranchers, however, the situation began to change. Within a few years the wolf reportedly was eliminated from the eastern part of its former range in Mexico and was decreasing in the western portion.

The spread of agriculture and livestock, and the construction of new roads giving access to remote areas led to a decline in wild prey—deer, antelope, and bighorn sheep—as well as to intensified efforts to eradicate the wolves. They were poisoned and trapped in large numbers. A joint Mexican-U.S. predator control program under the auspices of the World Health Organization initially worked with traps and strychnine, but in 1954 compound 1080 came into widespread use and was distributed to stockmen by the Pan American Sanitary Bureau.

Despite intensive persecution, however, the Mexican wolf may still be holding its own in some areas and may be a promising candidate for captive propagation efforts.

An official determination that an animal is an endangered species affords it the protection of the Endangered Species Act of 1973. Among other things this means that it is unlawful for any person subject to the jurisdiction of the United States to:

- Import or export the animal from the United States;
- Take any such animal within the United States or on its territorial seas;
- Take any such animal upon the high seas;
- Possess, sell, deliver, carry, transport, or ship by any means any animals taken in violation of the above;
- Deliver, receive, carry, transport, or ship any such animals in interstate or foreign commerce in the course of a commercial activity;
- Sell or offer for sale in interstate or foreign commerce any such animal.

This formal listing action brings the total number of animals officially listed as endangered to 428. A total of 139 of these are species found in the United States and its territories. In addition, the official list of threatened species now numbers 11 animals.

Michigan Hunters Fined in Eagle Killing

A Burton, Mich., man charged in the November shooting of a bald eagle near Lake City, Mich., was fined $5,000 and sentenced to six months in jail after pleading guilty in U.S. District Court in Grand Rapids.

The hunter was charged under the Bald Eagle Protection Act for the illegal killing of an immature bald eagle. The judge suspended the six-month jail sentence and $3,500 of the fine, but he then placed the defendant on two months probation. A codefendant entered a plea of guilty to the charge of accessory after the fact and was fined $100 in the shooting death of the eagle.

A witness who heard a rifle shot in the vicinity of the killing observed a truck in the area several hours later. The witness reported the vehicle's license number to wildlife authorities with a description of the suspects, and an investigation led to an indictment.

The witness is eligible for potential rewards totaling $1,900. A provision of the Bald Eagle Act authorizes payment of reward money to a witness whose information leads to the arrest and conviction of anyone killing a bald eagle. The act provides that a reward shall not exceed one half of the fine paid by a convicted eagle killer. In addition to the government's reward offer, the National Wildlife Federation, Michigan United Conservation Clubs, and the National Audubon Society also offer rewards for information leading to the arrest and conviction of suspects involved in eagle killings.

(Continued on p. 16)

field briefs

***Donald Collier**, left, retiring anthropology curator, is shown with Ignacio Bernal, director of the National Museum of Anthropology, Mexico City, as they view the Contemporary African Arts exhibit at its opening at Field Museum in April, 1974.*

***Adrian Desmond** (rt.), author of the just-published* The Hot-Blooded Dinosaurs *(Dial), is shown at Field Museum with **William Turnbull**, curator of fossil mammals, as they examine a fossil jawbone of* Gorgosaurus, *a dinosaur. Desmond was in Chicago recently on a promotional tour for his widely reviewed book, which is a study of dinosaurs and paleontologists generally, as well as an extended defense of the thesis that dinosaurs were warm-blooded creatures. Desmond, who is a specialist in the history of science as well as a paleontologist, is a doctoral candidate at Harvard.*

Donald Collier Retires

Donald Collier, curator of Middle and South American archaeology and ethnology, retired May 1, after 35 years as a member of Field Museum's Department of Anthropology staff. One of the world's leading authorities on indigenous cultures of South and Middle America, Collier most recently co-authored (with Donald W. Lathrap and Helen Chandra) *Ancient Ecuador: Culture, Clay and Creativity* (Field Museum Press, 1975), a catalog raisonné which accompanied an exhibit of the same name, also co-produced by Collier. The catalog is now in its second printing and the highly acclaimed exhibit has been shown in New York and Kansas City (following its initial showing at Field Museum); currently it is at the Smithsonian Institution.

Collier received his B.A. from the University of California and his Ph.D. from the University of Chicago. He joined the Field Museum staff in 1941 as assistant curator. In 1943 he was appointed curator and in 1964 became chief curator, Department of Anthropology. His field work has been done in Peru, Ecuador, Guatemala, Mexico, Oklahoma, Montana, South Dakota, Washington, and the American Southwest. From 1949 to 1973 he also served as lecturer in anthropology at the University of Chicago.

He is the author of two monographs in *Fieldiana: Anthropology:* "Survey and Excavations in Southern Ecuador" (with John V. Murra) and "Cultural Chronology and Change as Reflected in the Ceramics of the Viru Valley, Peru"; and of *Indian Art of the Americas,* also published by the Field Museum. In addition, he has contributed 46 articles to the Field Museum *Bulletin. Indians before Columbus* (University of Chicago Press, 1947), a general book on North American archaeology, was written with the late Paul S. Martin and George I. Quimby, and is still in print.

Collier comes from a family distinguished for its contributions to Native American studies. His father, John Collier, was U.S. Commissioner of Indian Affairs from 1933 to 1945 and was the principal architect of the Indian New Deal. He was one of the founders of the

Inter-American Indian Institute and wrote the widely read *Indians of the Americas*. John Collier, Jr., Donald's brother, is well known for his work in visual anthropology. Collier's wife, Malcolm, who also received a doctorate in anthropology from the University of Chicago, has done field work among the Navaho Indians and has participated actively on several of her husband's expeditions. For nine years she was director of the Anthropology Curriculum Study Project (sponsored by the National Science Foundation) and currently is doing research and writing on Jens Jenson and the Prairie School of Landscape Architecture.

Although formally retired from his post as curator, Collier will continue to be active in the field and at the Museum as curator emeritus. Between times he hopes to catch up on his sailing off Wisconsin's Door County.

Harold M. Grutzmacher, 1904-1976

Harold M. Grutzmacher, Field Museum employee for more than 36 years, died on May 6 in Grayslake, Ill., at the age of 72. Mr. Grutzmacher joined the Museum in 1932 as a printer and in 1962 he was promoted to head of the Division of Printing. He retired in 1969. Grutzmacher's son, Harold, Jr., now of Ephraim, Wis., was a temporary employee of the Museum from 1946 through 1956 while a student.

CORRECTIONS

The article "Tenth Anniversary for Women's Board," which appeared in the June, 1976, *Bulletin*, stated incorrectly that Mrs. William D. MacKenzie served as the first publicity chairman of the Women's Board. The post was actually held by Mrs. Wallace D. Mackenzie.

The caption beneath a painting reproduced on page 5 of the May, 1976, *Bulletin* stated mistakenly that the artist was unknown—a patent contradiction of the artist's clearly legible signature, "C. F. Browne," appearing in the lower right

(Continued on p. 18)

Museum Gift Shop Offers New Line Of Native American Artware

Warren Loschky, manager of Field Museum's Gift and Book Shop, announces the recent arrival of a new line of Native American art and reproductions at the Gift Shop. Among the new items are the following:

SOUTHWEST

Kachina Dolls (originals of "The Assassin," or "The Robber Fly"; "The Whipper's Uncle"; and "The Bumblebee" ($47-$86)

Pueblo Sand Paintings by Leonora Price and David V. Lee ($36-$45)

Blackware Pottery by Carlos Sunrise Dunlap, of San Ildefonso, N.M. ($19-$95)

Miniature Black-on-Black Bowl by Dolores Naranjo, of Santa Clara, N.M. ($65)

Carved Redware and Blackware from Santa Clara, N.M. ($22-$54)

Hopi Painted Ware by Rosetta Huma and Vina Harvey ($31-$47)

Acoma Painted Ware by E. Histia and R. Torivio ($19-$47)

CANADA, NORTHWEST COAST, ALASKA

Sweetgrass Thimble Baskets ($3.50)

Manitoulin Leather Dolls ($9)

Corn Husk and Feather Dolls with carved apple faces ($40-$45)

Bark and Quillwork Box ($45)

Prints—Northwest Coast stylizations, East Coast traditions ($17.50-$20)

Tlingit and Haida carving reproductions ($11-$45)

Left: *black-on-black bowl by Carlos Sunrise Dunlap, of San Ildefonso, N.M.* Right: *Acoma painted ware by E. Histia, of New Mexico. Among a choice selection of Southwestern artware now available at the Field Museum Gift Shop. Other items include kachina dolls and sand paintings.*

MEMBERS' FIELD TRIPS

As the result of our advance announcement in the June *Bulletin* of three field trips for members, two are almost filled as we go to press: the August 12–15 trip to the shark fields of Parke County, Indiana ($172.50), and the August 28–29 trip to Galena, Illinois ($62.50). If you are interested in either of these trips and wish to put your name on a waiting list, please call us at 922-9410, ext. 219. *But hurry!*

We still have spaces available for the five-day geology-botany trip to Michigan's Upper Peninsula, September 27 through October 1. There we'll visit geological sites that show the remnants of an ancient Precambrian mountain chain. A visit will be made to a working iron mine and its ore-milling operations, following the ore from rough form to pellets ready for shipment to steel mills.

The botanical highlights of the trip will be unique plant life of an acid bog and the maple-beech-hemlock forest in autumn colors. The weather should be cool and pleasant, and the fall colors at their peak brilliance. The trip, limited to 44, will be led by Dr. Edward Olsen, curator of mineralogy, and by Dr. William Burger, associate curator of botany. Cost of the trip: $260.00 per person.

Trip fee includes cost of motel room, transportation, meals, and gratuities, based on double occupancy. A small additional fee will be charged for single accommodations. Reservations may be made by writing to the Membership Department, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive. A $25.00 deposit should accompany your application. For further information please call Dorothy Roder, 922-9410, ext. 219.

Cafeteria Hours

The Field Museum cafeteria will be open until 7:30 p.m. on those evenings (Wednesdays, Fridays, Saturdays, and Sundays) on which there is a concert in Grant Park (late June through August). On other evenings the cafeteria closing time is 4:00 p.m.

OUR ENVIRONMENT

(Con't. from p. 13)

Wounding Eagle Costs $500

A bald eagle that was shot and wounded last year near Miller City, Ill., has been treated in Minnesota and released to the wilds. But the shooting that broke the eagle's wings cost an Indiana man $500. The hunter was charged with violating the Migratory Bird Treaty Act

The eagle had been downed on a goose club in southern Illinois. The injured bird was then sent to the University of Minnesota's Raptor Rehabilitation Center in St. Paul. There the bird's wings were repaired and it was held for two months' convalescence before being released to the wilds.

Wild Animals Make Lousy Pets

Wild animals do not make good pets. And most people who attempt to raise wild mammals or birds fail in their superficial role as foster parents of wildlife. That is the double-edged opinion of Gary Duke, a wildlife professor in charge of the raptor rehabilitation program at the College of Veterinary Medicine, University of Minnesota.

"I feel compelled to harp on this subject," says Duke, adding that "most wild orphans were not orphans in the first place." People who adopt wild animals, he observes, often believe they are helping a motherless nestling, when in fact, the act of kindness may become a kiss of death for the so-called orphan.

The typical backyard rabbit nest is a good example to illustrate the problems associated with misguided interest, he says. During daylight hours, a lactating rabbit will not make many trips to the nest to nurse her young. If the nest is located in a flowerbed near the kitchen window, observers may panic if the parent rabbit is not around.

"With good intentions, the concerned person or persons remove the young rabbits from their nest. The following day the rabbits start going downhill, and one of them dies. The would-be foster parents call the Department of Natural Resources or the Fish and Wildlife Service or they call us.

"If the rabbits have not been out of the nest too long, I tell the caller, 'Put 'em back and let the mother do her thing.' Often, however, too much time has elapsed and the foster parents end up with a shoebox full of dead rabbits."

The adoption of wild babies is a perplexing problem. On one hand, wildlife agencies have encouraged the public to respect and appreciate wildlife. On the other, the affection mania has been responsible for the untimely demise of mammals and birds that were loved to death as short-lived pets.

The problem centers on the individual animal. Professional management focuses on wildlife populations. Do losses from adoption seriously affect a healthy wildlife population? Argued in a technical vein of hard-nosed biology, which allows for some cropping of surpluses from any species, probably not. The same parameters that apply to pheasants would apply to songbirds, for example. But it would take Old World courage to suggest a recipe for robin pie, once a table delicacy in the South. And adjustments must be made to protect dwindling populations. What would happen, conservationists ask, if people were allowed to take individuals from the Kirtland's warbler population, an endangered species?

Some wildlife managers believe the problem is a matter of common sense, humane considerations, and perspective. They question whether "respect" and "love" should be used interchangeably when establishing a perspective for wildlife. The play on words also plays on human emotions and impressions, they say.

"Perspective is absolutely essential," a veteran wildlife manager said. "A sugar-coated treatment of wildlife negates wildness and distorts the facts. Giving wild animals names and promoting the love syndrome creates a fairyland concept of nature. The wild pet fad is just one of several problems that break down true wildness. There is no 'Blue Fairy' in real nature. Let's tell it like it is and keep wildlife in accurate perspective. A backyard bird feeder is most acceptable; bringing a fawn indoors is not."

Duke observes that "We can't criticize people who are enthusiastic and want to help, but the adoption problem is something we should clarify. The main point to be made is that people should be absolutely sure the mother animal is not available to care for her young before interfering with the natural processes of nature."

Anyone who attempts to raise a wild animal takes on the taxing and laborious responsibilities of feeding and care that foster parents assume when they adopt a child. But there is a noticeable shortage of "baby books" and animal hospitals for wild pets. Science is still struggling with the problems of wildlife diseases and nutritional requirements, says Duke.

"Most veterinarians are qualified to treat domestic animals but few have the training to diagnose diseases in wildlife. The training simply isn't available. Here at the center we're learning about diseases and nutrition as we care for wild things. The training gap can cause frustration and expense for pet owners when their wild orphans become ill. Treating fractures is one thing, but diagnosing exotic diseases is another matter entirely."

The gap is further widened by a federal regulation that requires a veterinarian to have a "special purpose salvage permit" if he handles endangered or protected species. While addressing his immediate area of expertise—treating and handling wild birds in captivity—Duke says that exotic pet birds may carry bacteria for diseases in poultry. Moreover, other diseases are transmitted to still other wild pets. Frounce, a disease triggered by an organism carried normally by wild pigeons, can produce lesions in the mouth of a hawk or owl that eats pigeons carrying the organism. The St. Paul center recently received a raptor whose mouth was so filled with lesions that the bird was unable to swallow food.

In custody of an inexperienced person, the odds of a wild bird surviving are shockingly poor. Duke estimates that "only two out of every hundred will make it." He tells of a woman in Rochester, Minn., a concerned person who discovered an ailing golden crowned kinglet on a sidewalk. "I'm always interested in trying to help, but when she called I told her the bird's chances for recovery were rather poor. She insisted I see the kinglet anyway. She drove to St. Paul, with the bird in a box. When she delivered it to my office, I reached in the box, picked up the bird, and it died!"

Stress—a word that Duke does not like to use in the technical sense "because it is too vague"—is, in one form or another, mingled among the things that affect a wild animal's reaction to handling and captivity. Properly cared for, large birds appear to get along rather well in captivity, but the smaller birds, he notes, are "less resilient."

Duke expresses doubt about the dedication and expertise that most people would muster while acting as substitute parents for wildlife. The possession of any wild bird wears thin for the amateur, particularly when feces and feathers are scattered around the house, he says.

Critical ramifications are involved with the feeding and care of any wild animal. Captivity has a marked effect on the wild behavorial mechanism inherent in all wildlife. An owl, for example, likes to be active at night, yet most owl keepers probably go to bed with the rest of the world when darkness sets in. During night flights, an owl will hunt and take on nourishment. Duke examined an owl delivered to the center and discovered it had rickets —"a victim of improper care."

Even when a wild pet survives and is set free, the complicated problem of "rehabilitation" arises. For humane odds in the wilds, it must be retrained to become wild again. Careless owners of raptors have been known to sustain their pets on hotdogs and hamburgers—crude care that often becomes a death warrant for captive birds when they are set free.

Proper feeding is not only critical for birds of prey that must learn how to hunt when they are released—a skill considerably more difficult than eating seeds—but feeding is also a complex matter when raising common wild birds. Says Carl Madsen, a noted eagle authority with the U.S. Fish and Wildlife Service, "One can go to a store and buy quality cat food or dog food, but it would be almost impossible to buy, say, proper kildeer or robin foods."

"Madsen is right," says Gary Duke. "Take the seed-eaters, for example. A person might successfully raise a seed-eater on sunflower seeds. When the bird is released—and this is the ultimate goal for any wild thing being cared for—it will go out into the world searching for sunflower seeds. It won't find enough sunflower seeds to keep it alive, of course, and it will ignore other useful seeds because it was not trained by a parent to seek and eat them."

Ownership of exotic animals carries risks beyond the ordinary complications associated with raising rabbits or songbirds. Leading veterinary journals have become disenchanted with the chic set strolling down the avenues with ocelots, lions, and other exotic beasts. The journals have published many articles advising veterinarians to tell their clients that exotic animals make poor pets.

Professional wildlife people suggest the same thing, not only for biological reasons that defend wildness, but also because wild animals are unpredictable. Wild pets are not generally cuddly and affectionate, they say. And the most trusted beast may turn on a child or adult and inflict serious injury. The liability involved was compared by a biologist to having "an unfamiliar cocked and loaded pistol on a living room chair."

"Profit" is still another reason why people snatch babies from wild nurseries. A limited number of people engage in illegal imports of exotic animals. "These people attempt to sell the animals for profit," says David Swendsen, assistant special-agent-in-charge at the U.S. Fish and Wildlife Service Regional Office in Twin Cities, Minn.

After 20 years of law enforcement with the service, Swendsen is "convinced" that regulations to control and prohibit the possession of wildlife are necessary. "We have to begin somewhere, and this is why we have regulations and laws to protect wildlife—even from the well-meaning people who morally think they are doing no wrong when they pick up wildlife."

Birds of prey and most other species are protected by rigid state and federal laws. A long list protecting migratory birds excludes, among the species, only starlings and English sparrows. The endangered species act protects a wide variety of foreign and resident wildlife. Within the legal framework now in force to protect wildlife, few species may be taken into personal custody.

Despite the laws of courts and nature, people still tinker with wildlife in obnoxious ways. In doing so, Swendsen says, they gamble with potential fines, embarrassment, and prison sentences for serious convictions—such as selling migratory birds. In 1975, three Minnesota residents were convicted in U.S. District Courts of selling migratory birds, a felony under the Migratory Bird Treaty Act. □

Traditional Iroquois Mask-Carving

From Monday, July 26, through Sunday, August 1, Museum visitors will be able to observe Jacob Thomas, noted Iroquois ceremonial leader, demonstrate mask-carving. The carved wooden masks of the Iroquois "Falseface Society" are one of the most striking aspects of contemporary traditional Iroquois culture. Some of Thomas's work will be used in the new Iroquois exhibit, which will be on view later this year in Hall 5.

THE TRIBAL EYE

Film Series on Tribal Societies

A six-film series free to members and visitors; no advance registration necessary. Selected tribal societies are treated, showing the relationship between their artistic achievements and their history, social organization, and physical environment. Narrated by David Attenborough. Films in the series will be shown Fridays at 2:00 and 7:00 p.m., Saturdays and Sundays at 2:30 p.m. in the 2nd floor North Meeting Room, Field Museum.

July 16, 17, 18: **The Crooked Beak of Heaven** views the Kwakiut and other Indian tribes of America's northwest coast. Focuses on their long winter dramas, wood-sculptured totem poles, and potlatch ceremonies.

July 23, 24, 25: **Behind the Mask** studies the Dogon people of Mali, emphasizing their carved masks, images, and granary doors, the role of priests and blacksmiths and the importance of various ceremonies in tribal life.

July 30, 31; Aug. 1: **Man Blong Custom** surveys the artistic and ceremonial traditions of the Melanesian islands, explores the rituals of the cult house, traces the decline of the ancient religious customs under the influence of Christian missionaries, and shows how these customs have begun to revive.

Aug. 6, 7, 8: **Woven Gardens** studies the weaving of hand-knotted rugs by the women of the nomadic Quashqai of Iran, showing how a rug may contain clues to the ancestral history of the tribe.

Aug. 13, 14, 15: **Kingdom of Bronze** examines the "lost wax" method of casting in bronze employed for some 500 years by the Nigerian metalworkers of Benin to create magnificent figurines in honor of their rulers and for fertility rites.

Aug. 20, 21, 22: **Across the Frontiers** explores the impact—positive and negative—of the modern world on tribal cultures. Discusses the inevitability of change, and argues that tribal art remains meaningful even in today's technological society.

FIELD BRIEFS

(Con't. from p. 15)

corner of "Chicago in 1831." This was an error made no less embarrassing to the editor by the fact that the original painting hangs in the Chicago Loop office of a Field Museum trustee, Edward Byron Smith.

In 1914 Charles Frances Browne completed the painting, which is subtitled "Looking West from the Head of La Salle Street." Browne was born in 1859 and died in 1920; he did much of his work in the Midwest, particularly Chicago. He specialized in landscapes, taught at the Art Institute of Chicago, and was art critic for the *Chicago Sunday Tribune*.

Books

The Cashinahua of Eastern Peru
Studies in Anthropology and Material Culture, Vol. One
Jane Powell Dwyer, editor
Published by the Haffenreffer Museum of Anthropology, Brown University, Providence, R.I., 238 pp. (paper), $10.00

Among anthropologists, there is a growing interest in material culture studies; research on the objects people make is no longer seen as less important than the study of social organization and religion. One aspect of this trend is the reevaluation of museum collections. Scholars are using fresh approaches and new research techniques to study the materials which have been tucked away in the storerooms of the world's great museums for decades, sometimes for centuries. Evidence of this trend is the ever-increasing number of researchers from all parts of the world who visit the Field Museum's anthropology collections, finding here a wealth of unexplored data.

The Cashinahua of Eastern Peru represents this new trend in anthropology. A handsomely-designed volume, it is the first in a series that is to be based on archaeological and ethnographic collections of the Haffenreffer Museum, located in Bristol, R.I. This book concerns the Cashinahua, a group living in the tropical forest of eastern Peru. It is the most complete work in English on the material culture of the South American tropical forest; similar studies have appeared only in German.

Phyllis Rabineau, custodian of Field Museum's anthropology collection, is author of the article "Artists and Leaders: the social context of creativity in a tropical forest culture," and of the 88-page catalog of the Cashinahua collection. Other papers in the volume describe weaving, ceramics, and graphic design. A thorough description of Cashinahua daily life and social organization is contributed by Kenneth Kensinger. Kensinger, who assembled the collection at the Haffenreffer Museum, as well as smaller Cashinahua collections at Berkeley and the University of Pennsylvania, acquired his knowledge of their culture during many years of field work.

Phyllis Rabineau's work describes and interprets in depth one aspect of the Cashinahua materials—ceremonial headdresses made of feathers. Although all adult Cashinahua men make feather headdresses, some men make headdresses which are admired by the members of the community, while other headdresses are criticized as poorly designed or poorly executed. Rabineau examines the formal properties which provide the basis for these distinctions, and isolates the social factors which encourage or stifle individual creativity among Cashinahua men. The symbolism of feathers as a medium of spiritual power provides an insight into why some men are able to produce acceptable headdresses and others are not. Secure social position, linked with mental well-being, allows men to competently handle ritual items. Conversely, marginal social status and erratic psychological makeup result in aberrant handiwork.

The catalog of the collection describes the manufacture and use of objects from all aspects of Cashinahua life. Native terms are given for each type of object, and photographs and drawings are provided. The entire book is endowed with vitality by Kensinger's field photographs, showing Cashinahua making and using both secular and sacred objects. *The Cashinahua of Eastern Peru* may be purchased directly or ordered through the Field Museum Book Shop.

Between Friends/Entre Amis, the book on which the current exhibit of the same name is based, may be ordered at the Book Shop. The publisher has announced a prepublication price of $32.50 (until Aug. 1). The price thereafter will be $42.50.

JULY/AUGUST at Field Museum

SPECIAL SUMMER PROGRAMS

"The Tribal Eye." An outstanding film series, produced by Britisher David Attenborough, illustrates tribal societies from Africa to the Arctic—their rituals and their art. Films will be shown, from July 16 through August 22, on Fridays at 2:00 p.m. and 7:00 p.m.; Saturdays and Sundays at 2:30 p.m. Meeting Room, second floor north. (See page 18 for details.)

Museum Highlight Tours. From July 6 through August 31 (Monday through Friday) museum education staff and volunteers conduct tours through a number of the anthropology and natural science exhibits. Meet at the information booth, 2:00 p.m.

"Friend or Foe?" A free, self-guided tour for children, about animals that have been feared, misunderstood, or misrepresented in the past—such as the bat, toad, wolf, rattlesnake, and tarantula. All children who can read and write are invited to participate. Journey sheets in English and Spanish are available at the information booth. Bring pen or pencil.

Members' Field Trips. Sign up now for this year's Members' summer and fall field trips. (See page 16 for details.)

SPECIAL EXHIBITS

"Between Friends/Entre Amis." A newly opened exhibit of 220 color photos of the land and the people taken along the 5,525-mile United States/Canadian border. The exhibit, in Hall 26, is a Bicentennial gift from the Canadian people to the people of the United States and was produced by the Still Photography Division of the National Film Board of Canada. Through September 7.

"There's a Sound in the Sea." This special exhibit features nearly 90 original whale poems and paintings by children from all over the United States and Canada. The exhibit, complete with excerpts from the "Song of the Humpback Whale" album, also incorporates scientific information on the evolution, biology, and intelligence of whales —and the tragic results of commercial whaling. Through August 8.

"Pterosaur." An aluminum and brown-fabric stylized model of the largest known flying creature—an extinct pterosaur—hangs at balcony level in Stanley Field Hall. The model, having a wingspan of 51 feet and a body length of 31 feet, dramatizes the pterosaur fossils and a scientifically accurate epoxy model of the *Rhamphorhynchus* skeleton on display in the northwest arcade, second floor.

"Man in His Environment." The Field Museum's Bicentennial exhibit takes a global view of some of the most serious environmental problems now confronting all mankind and asks visitors to involve themselves in decisions that have to be made. A salt marsh—recreating one at Sapelo Island, Georgia—offers a unique opportunity to study basic ecological principals within a total marsh environment. Hall 18.

(CALENDAR continued on back cover)

JULY/AUGUST at Field Museum

(CALENDAR continued from inside back cover)

CONTINUING PROGRAMS

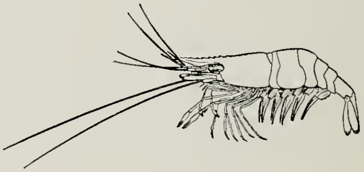
"Environment: The Sum of its Parts." The best and newest environmental films are offered in conjunction with the *Man in His Environment* exhibit (see above). Films are shown at 11:00 a.m. and 1:00 p.m. in the Meeting Room, second floor north.

The July theme is "Human Alternatives: Key environmental problems that we now must face."

July 2, 3, 4:	*But is This Progress* (51 min.)
July 9, 10, 11:	*The Great Sea Farm* (25 min.) *Should Oceans Meet?* (30 min.)
July 16, 17, 18:	*Energy: A Matter of Choice* (22 min.)
July 23, 24, 25:	*Multiply and Subdue the Earth* (67 min.)
July 30, 31, Aug. 1:	*Pollution—A Matter of Choice* (53 min.)

The August theme is "The Question of Tomorrow: Documentary and fantasy versions of what the future can hold for us."

Aug. 6, 7, 8:	*Eggs* (10 min.) *Technology: Catastrophe* or *Commitment* (22 min.)
Aug. 13, 14, 15:	*Future Shock* (42 min.)
Aug. 20, 21, 22:	*The Unexplained* (52 min.)
Aug. 27, 28, 29:	*Coping with Tomorrow: Superconductors* (18 min.) *Man and the "Second" Industrial Revolution* (19 min.)



"Discovery Program." Tours, demonstrations, and participatory activities are offered every Saturday from 11:00 a.m. to 3:00 p.m. Topics vary but often include:

Snakes—Live snakes are featured in the Hall of Reptiles and Amphibians (Hall 19).

Early Man—A half-hour tour traces major trends in the physical and cultural evolution of man.

Dinosaurs—Visit the Hall of Dinosaurs (Hall 38) and make a clay dinosaur to take home.

Ancient Egypt—A half-hour tour through the Egyptian collection (Hall J), including an explanation of the hows and whys of mummy-making.

For specific programs and times, phone the museum or inquire on arrival at museum entrances.

Special-Interest Meetings
Open to the Public

July 14, 7:30 p.m.	**Windy City Grotto, National Speleological Society**
July 21, 8:00 p.m.	**Illinois Mycological Society** (meets third Wednesday of alternating months)
Aug. 11, 7:30 p.m.	**Windy City Grotto, National Speleological Society**

Summer Hours

The Museum opens at 9:00 a.m. and closes at 6:00 p.m. every day except Friday. On Friday, year-round, the museum is open to 9:00 p.m. Through Labor Day (on Grant Park concert nights) the museum remains open until 9:00 p.m. on Wednesday, Friday, Saturday, and Sunday. Food service areas are open 11:00 a.m. to 4:00 p.m.

The Museum Library is open 9:00 a.m. to 4:00 p.m., Monday through Friday (closed July 5). Please obtain pass at reception desk, first floor north.

Museum Telephone: 922-9410

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Field Museum of Natural History Bulletin

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Field Museum of Natural History

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Director: **E. Leland Webber**

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CONTENTS

3 **Pollen**
By William Burger and Christine Niezgoda
Photography by Fred Huysmans

7 **Shedding Light on "Discovery"**
By Sally Parsons

8 **Field Briefs**

9 **A Backward Glance:** *Field Museum 75, 50, and 25 Years Ago*

11 **Members' Field Trip to Michigan**

12 **Inching Along to a Metric America**
By Edward Olsen

14 **Our Environment**

19 **September at Field Museum**
Calendar of Coming Events

COVER

Pollen grain of Dorstenia contrajerva *(mulberry family) as seen through Field Museum's scanning electron microscope. Magnified about 10,230 times. Photo by Fred Huysmans. For more on pollen see page 3.*

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POLLEN

By William Burger
and Christine Niezgoda

Photography by Fred Huysmans

For persons who suffer from hay fever, pollen is a wind-borne affliction. For those who look carefully at flowers, pollen is a powder, often yellowish, produced at the tips (anthers) of stalks (filaments) near the flower's center. For bees, pollen is an important part of the food supply, gathered to supplement the honey made from nectar. For the plants that produce it, pollen is an essential part of their sexual reproductive cycle.

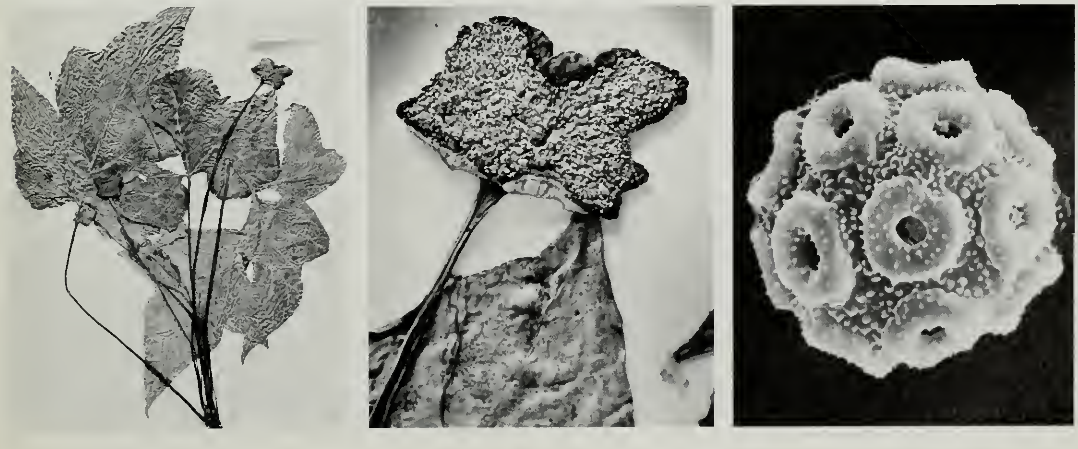
Pollen grains are formed within the anther sacs (male apparatus of the flower) from special reproductive cells known as pollen mother cells. These divide twice to produce four grains. Uncommonly, the four grains may remain together to form what is known as a tetrad; occasionally polyads are formed from more than four grains. Usually, however, the four pollen grains separate and, together with the products of many other pollen mother cells, fill the anther sacs. When the pollen is mature the anther sacs open and the pollen is ready for dispersal.

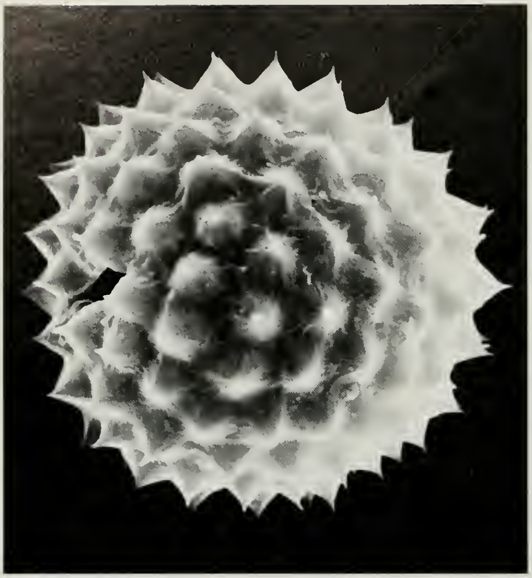
To accomplish its function the pollen grain must be able to travel long distances, withstanding dessication and physical stress along the way. In the flowering plants, pollen may be carried by a great variety of dispersal agents, such as insects, birds, bats, and the wind. If all goes well, the tiny grain will be carried to the receptive surface, or stigma, of the female floral parts in a distant flower. Here something special happens. The pollen grain "germinates": it begins to grow in the form of a narrow tube, first on the surface of the stigma, and soon down into the tissues towards the ovule, bringing the male sperm nucleus, to the female egg cell. But this can happen only when the pollen grain lands on the appropriate stigma—in a flower of the same species.

Foreign pollen may germinate, but its growth soon ceases. This suggests that there must be a process of recognition, a dialog between the "male" pollen grain and the "female" stigma. The outer wall must carry recognition substances that tell

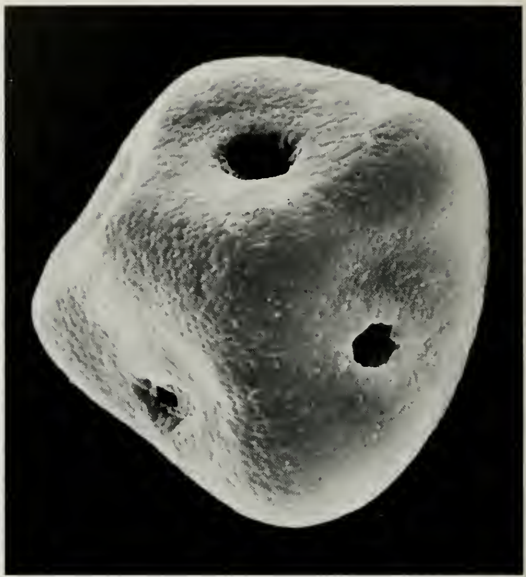
William Burger is associate curator, vascular plants, and Christine Niezgoda is an herbarium assistant in the Department of Botany.

Left: Preserved specimen of *Dorstenia contrajerva* L. Moraceae family (mulberry). **Center**: Enlargement of inflorescence shown in upper right of left photo. **Right**: Pollen grain (3,411X) taken from preserved inflorescence.



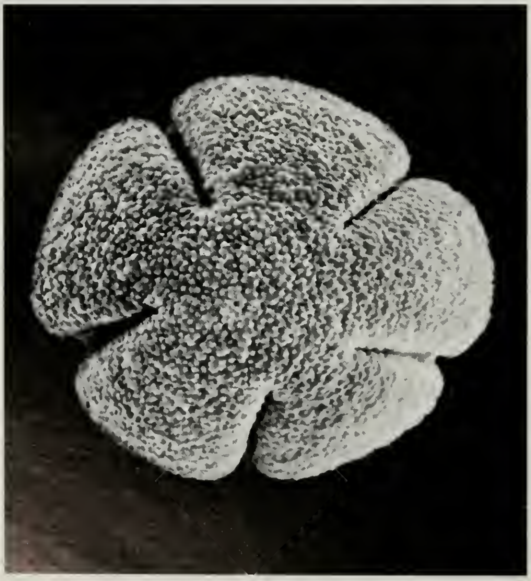


Ambrosia artemissifolia, common ragweed; Compositae (daisy family). Echinate, or spiny, surface. This pollen is a common cause of hay fever. (4,605X)

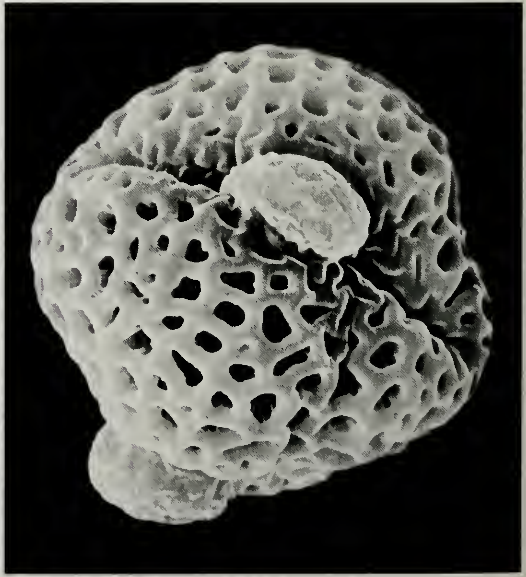


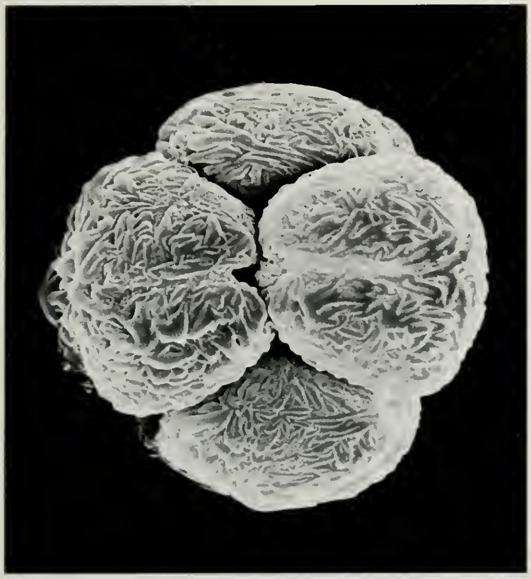
Leucaena canescens; Leguminosae (pea family). Porate grain (with pores); foveolate, or honeycombed, surface. (2,730X)

Diplacus longiflorus; Scrophulariaceae family (figwort). Pentacolpate grain (having 5 furrows); granulate surface. (2,930X)

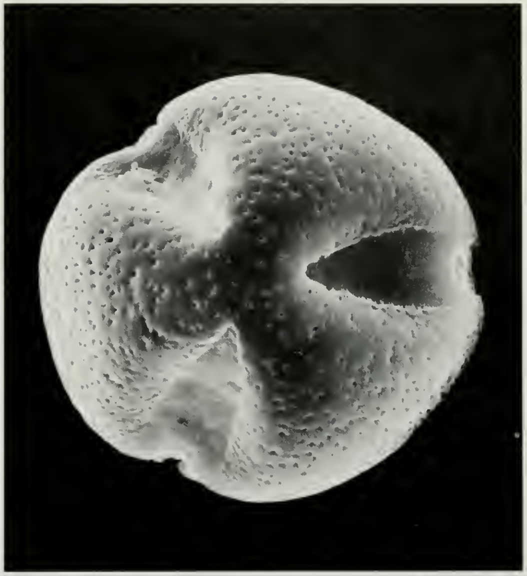


Bathysa peruviana; Rubiaceae (coffee family). Reticulate, or net-veined, surface with unusual protrusions in the furrows. (6,730X)



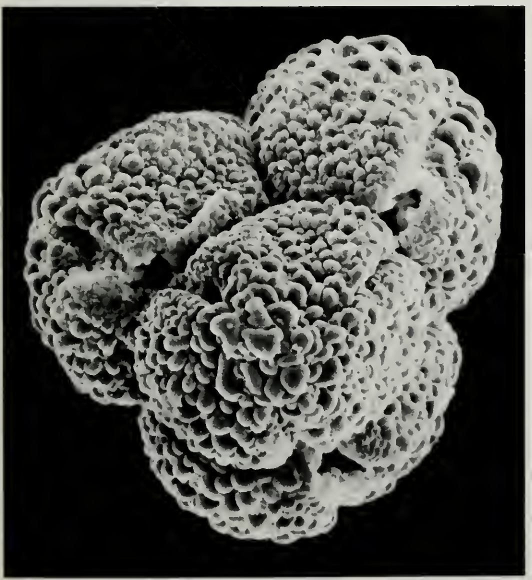


Schleinitzia microphylla; Leguminosae (pea family). Four grains forming a tetrad. Striate surface. (1,615X)

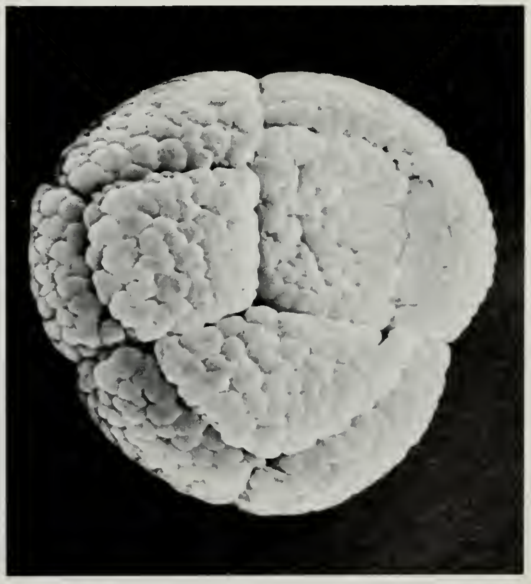


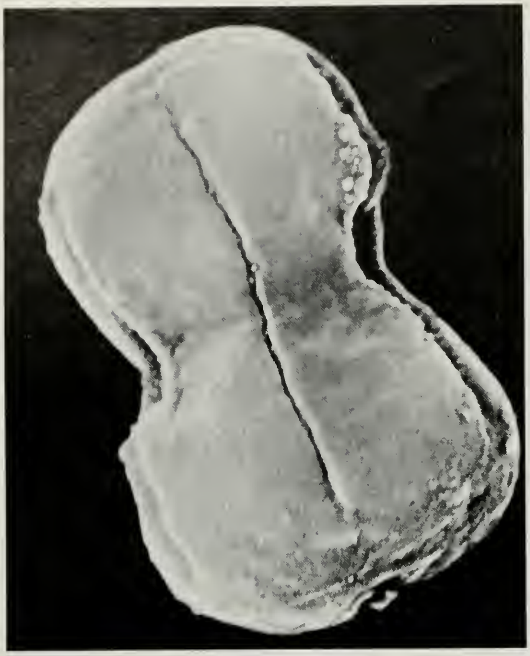
Leucaena leucocephala; Leguminosae (pea family). Tricolpate grain (having 3 furrows); foveolate, or pitted, surface. (2,030X)

Bouchetia sp.; Solanaceae (potato family). Four grains forming a tetrad. Verrucate, or warty, surface. (1,765X)



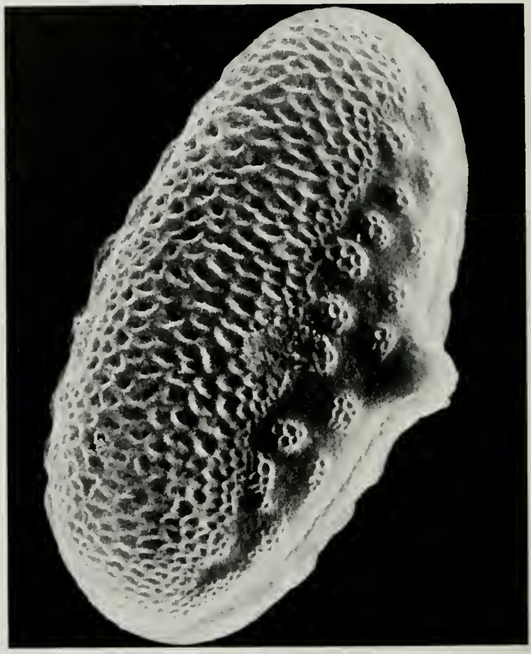
Piptadenia colubrina; Leguminosae (pea family). Twelve grains forming polyad. Verrucate, or warty, surface. (3,475X)





Hackelia sp., stickseed; Boraginaceae (borage family). Pandurate, or fiddle-shaped, grain. (9,500X)

Justicia sp.; Acanthaceae (acanthus family). Reticulate, or net-veined, surface with areolae (small rounded projections). (2,470X)



the stigma "this is the right pollen, get the welcome ready." Recent studies have shown that pollen grains do exude substances to which the stigma responds. If the pollen grain is of the right kind, its chemistry will trigger responses in the stigma that promote the growth of the pollen tube, and ultimately result in fertilization. The recognition substances in the pollen wall are the same as those responsible for the allergic reactions in hay fever.

In flowering plants the pollen grain has another important function. The pollen tube also carries a second nucleus to the ovule which then unites with two other female nuclei; this union produces the nutritive material called endosperm that will nourish the new embryo as it develops within the protective seed. The process of pollination is, therefore, much more sophisticated than we might suspect. The transfer of pollen by wind or bees is only an early part of the process that culminates with the fusion of a male nucleus with the egg nucleus to form an embryo in the process of fertilization.

The physiology of pollination is itself a fascinating study, but an equally fascinating study—of special interest to us at Field Museum—is the use of pollen grains as taxonomic aids: pollen, it has been discovered, is often of value in demonstrating relationships between flowering plants. It is the basic architecture of the wall of the pollen grain that interest us. This information, fortunately, can be obtained from preserved as well as from living plants; and many of the two million specimens preserved in our herbarium collection can therefore yield such information. The pollen wall preserves so well that we can retrieve information from plants that were collected more than a century ago.

Field Museum's scanning electron microscope (SEM) is an essential tool in this research, for it provides a unique view of the pollen grain, impossible to obtain with an optical microscope. Instead of the fuzzy outlines with very little depth of field, as seen under the optical microscope, with the SEM we can observe with remarkable clarity and great depth of field the pollen grain as a three-dimensional object. Characters that are diagnostic in the study of pollen include size, surface sculpturing, the number of pores and furrows and their placement on the pollen wall. SEM photos reproduced on pages 4 and 5 give an idea of the complexity and variety of some of these characters. All photos were made by Fred Huysmans, Field Museum's scanning electron microscope technician.

Shedding Light on "Discovery"

By Sally Parsons

A BIG SQUARE BOX on wheels was sitting outside Hall 27 of the Field Museum one recent Saturday. Visitors peering in saw a lot of dirt, some funny looking stones, broken pieces of clay, and a trowel. Actually, the visitors were confronting two square meters of Illinois prehistory. The authentic full-scale model, complete with potsherds and stone tools, is a reconstruction of an archeological dig from Dixon Mounds, in southwestern Illinois. It represents evidence of human culture of the Mississippian period—about 1,000 years ago.

Lee Erdman is the builder of the box (or "square" to those in the know). He explained to the visitors what they were looking at. This particular Saturday in July marked the inauguration of Lee's presentation on Illinois archeology; it also marked the end of six months of painstaking preparation by Lee and Nancy Nelson. Nancy and Lee are two of the sixteen volunteers who make possible the "Discovery" program, an ongoing weekend series of tours, demonstrations, and participatory activities presented to Museum visitors. "Discovery" is one of only a handful of such programs in the country. Each presentation relates directly to an exhibit or, as in the case of "Illinois Archeology," supplements existing exhibits by tying in with the Museum's general frame of reference.

In 1975 these enthusiastic volunteers offered fourteen different tours and eight kinds of demonstrations/activities to 32,000 visitors. Most of these events take place on Saturdays. On a typical Saturday, a Museum visitor can choose from among seven to ten of these events, on subjects ranging from Chinese art to dinosaurs.

The "Discovery" program began inauspiciously in a file folder of Carolyn Blackmon, head of program development in Field Museum's Department of Education. Carolyn is also coordinator of the volunteer program and, as such, places volunteers in the various Museum departments where they can best be of service. Until 1974, no opportunities existed for volunteer work on weekends. So Carolyn filed away for future reference the names that came her way — including Lee's. His full-time job as a conveyor belt salesman did not allow him to develop and strengthen his academic background in anthropology. Sydney Allport's circumstances were similar — her job as a map librarian did not permit expression of her life-long interest in Egyptian archeology.

Sydney's and Lee's interest in volunteering did not go long unnoticed. The Museum received a grant from the National Endowment for the Arts to expand its public programming. And Julie Castrop, a member of the Department of Education, expressed interest in developing a weekend volunteer series. Julie's interest stemmed from a perceived need to better acquaint weekend Museum visitors with the exhibits and to provide more background information on exhibit subjects. The Department of Education has successfully achieved this objective for many years with school groups. But what about that elusive entity—the "general public"?

"There's so much here that it's sometimes difficult for the visitor to get oriented without assistance," Julie stated. "A rock labeled 'samarskite' might induce ecstasy in the soul of a geology curator, but what does it mean to a family walking through the geology hall? And what, if any, cultural values are communicated to the lone visitor who wanders through hall after hall of native American artifacts?"

With such questions in mind, in October 1974, Julie and eleven volunteers began to evolve a set of programs to answer some of these needs. Now, almost two years later, the wheels are still in motion. The volunteers continue to test new ideas, dropping the ones that fail and expanding into new areas. Seven of the original eleven volunteers are still active in "Discovery." Nine more have jumped aboard, each bringing his or her own special talents and interests. ➤

Sally Parsons, a volunteer, is a free-lance writer.

Volunteer Carol Mudloff (left) explains taxidermy techniques to Saturday visitors.

Who are these intrepid souls who give up the sixth day of their busy work weeks to spend at the Museum? Their occupations range from sales representative to social worker, from exhibit designer to entrepreneur. Many majored in anthropology or science in college and supplement bread-and butter work with outlets at the Museum that satisfy their intellectual interests. Others became volunteers because the Museum awakened their curiosity in natural history and they wanted to share their enthusiasm with others.

Beth Stoneburg, a data collector for the U.S. Department of Labor, is one such volunteer. She has an academic background in economics. Beth applied to be a "Discovery" volunteer on the same day she came in as a casual visitor and took a tour offered by one of the other volunteers. Several months and about six geology books later, Beth began her own tour — "The Restless Earth."

"It's neat being part of a prestigious institution like the Field Museum," Beth remarked. "It's fulfilling and there's a great sense of belonging."

In 1975, more than 14,000 visitors flocked to a presentation of Dave Humbard and Bonnie Samuelson. Many approached with trepidation. Dave, a member of the Chicago Herpetological Society and an avid amateur reptile fancier, brought in live snakes and other reptiles from his home. He and Bonnie gave visitors the opportunity to touch the reptiles—for many a new and awesome encounter. The volunteers also helped visitors find answers to their questions by referring them to the exhibits. Dave's "roommates" include boas, Burmese pythons, an anaconda, and a monitor lizard. His greatest satisfaction has been in dispelling misconceptions and fears about reptiles.

Carol Briscoe, journalism major turned advertising manager, came to the Museum offering her writing experience to develop visitor guidebooks. Then, somewhat hesitantly at first, she began to apply her knowledge of Egypt by giving tours of the Ancient Egyptian hall, one of the consistently most popular programs.

Carol admitted she's basically timid, but "I found out there's a bit of a ham in me too. And I feel appreciated."

The volunteers get the ideas for their presentations from a variety of sources: walking through the exhibits, burrowing into their own backgrounds, and picking up on suggestions from Julie, other volunteers, and curators. Sometimes a special exhibit spurs them into action. The Ecuadorian pottery exhibit spawned a body-stamping activity as well as bilingual tours. The recent Alaskan Eskimo art exhibit triggered tours and Eskimo folktale sessions. Often, several volunteers become interested in the same subject and merge their talents and energies into developing different approaches or larger projects.

"Discovery" is not without constraints. Since the main resources of the Museum—the library, the collections (except the relatively small segment on display) and the scientific staff—are not available on weekends, volunteers must often do their research at university libraries. Sometimes, after months of study, a chosen exhibit hall will close down unexpectedly for renovation. And even the most brilliantly conceived ideas can fall flat for lack of money or materials. But once these constraints are accepted, the volunteers find their ideas meet with hearty endorsement—and healthy criticism—from Julie. "The Discovery volunteers," she observes, "have made an extremely valuable contribution to the Museum, bringing the exhibits to life for the visitors."

Because of the success of "Discovery," the Department of Education would like to expand the program to Sundays, providing a full range of educational services. Julie will be recruiting ten or twelve new volunteers to begin orientation sessions in October. If they're as lucky as the veterans, they'll have the opportunity to look behind the scenes into areas of the Museum the general visitor never gets to see.

Those interested in applying are encouraged to call Julie Castrop at the Museum (922-9410, extension 362) for an application form.

Prospective Volunteers

A three-session Museum orientation for Members interested in joining the Department of Education as volunteers will be held October 14, 21, and 28 from 10:00 a.m. to 3:00 p.m. The sessions are designed to prepare such persons for the role of facilitator—a person who aids groups visiting the Museum by providing information, guidance, and suggestions that will make their Museum visit even more meaningful.

Interviews with prospective volunteers will be held September 13 through September 24. Please write to Carolyn Blackmon, Field Museum, for further information about the program.

Field Briefs

A New Wrinkle in Taxidermy: Stuffed People?

The following enquiry appeared recently in "Beeline," a question-and-answer column that appears regularly in the *Chicago Daily News:*

"I recently visited the Field Museum of Natural HIstory, and was impressed by the lifelike appearance of the figures in the Stone Age cavemen dioramas. Or ARE they real people—stuffed? If so, how could I arrange eventually to leave my body to the museum for use in an exhibit? I had planned on leaving it to science, but I think I would like something like this better . . . " — *W. H., Chicago.*

Answer: "The figures in the Field Museum's cavemen exhibits are not real people, stuffed. They are made of fiber glass or plyester resins. Once, they were made of plaster of Paris, but beginning a few years ago they were remade, because the other materials are more durable and require less care; and, as you indicated, they also are more lifelike. Furthermore, stuffing a human body is illegal under laws pertaining to taxidermy. And the ways in which a human body legally may be disposed of do not include stuffing. . . . "

Stolen Eskimo Pipes Recovered

Thanks to persistent efforts by the Chicago Police Department and by Senior Sargeant of the Guard Glenn Peterson (Security and Visitor Services), the Museum has recovered three rare Eskimo walrus ivory pipes stolen from the building last February. The pipes had been taken from a display case in the temporary "19th Century Alaskan Eskimo Art" exhibition. Two of the pipes were recovered in damaged condition, according to James W. VanStone, curator of North American archaeology and ethnology. Two Chicago men were charged and convicted of felony/theft in connection with the case.

A Backward Glance...

75 years ago

From *Annual Report of the Director* for 1901: "The sum of $1,000.00 was bequeathed to the Museum by the late Huntington W. Jackson. This brings to mind the fact that the president during the year supported the movement to amend the law regarding the inheritance tax, and the Museum is to be congratulated on the success with which the concerted efforts of the various institutions in the country have been crowned, the objectionable law having been repealed by the United States and the State of Illinois. . . ."

"Work in [the taxidermy] division has been unusually active and results of the very highest character have been attained. New methods in mounting specimens have been adopted and in consequence a perfection of work never before attained has been secured. Five large groups are nearing completion, one of zebra and four of the Virginia deer in spring, summer, autumn, and winter, this last being distinguished by a wealth of accessories and detail never before attempted in this class of work. . . ."

"Important accessions in [the Anthropology] Department have resulted from several expeditions in the field: Mr. [Charles F.] Newcombe among the Haida Indians, Dr. [Merton L.] Miller among the tribes of the Shahahtian stock, Dr. [J.W.] Hudson in California, Assistant Curator [Stephen C.] Simms among tribes of the Pyman and Yuman stock, Assistant Curator [Charles L.] Owen among the Apache and Navajo tribes, and Curator [George A.] Dorsey among the Osage, Pawnee, and Wichita tribes. . . ."

"A femur and humerus of a dinosur, the largest ever discovered, were placed on exhibit. The femur. . . was 6 feet 8 inches high and weighed 675 pounds. . . . Working of the dinosaur quarries in Colorado, which were discovered and partially exploited in 1900, was continued during several months of the summer of 1901 by a party under the direction of Assistant Curator Elmer S. Riggs. The work involved considerable blasting, tunneling, and the construction of a temporary ferry. . . ."

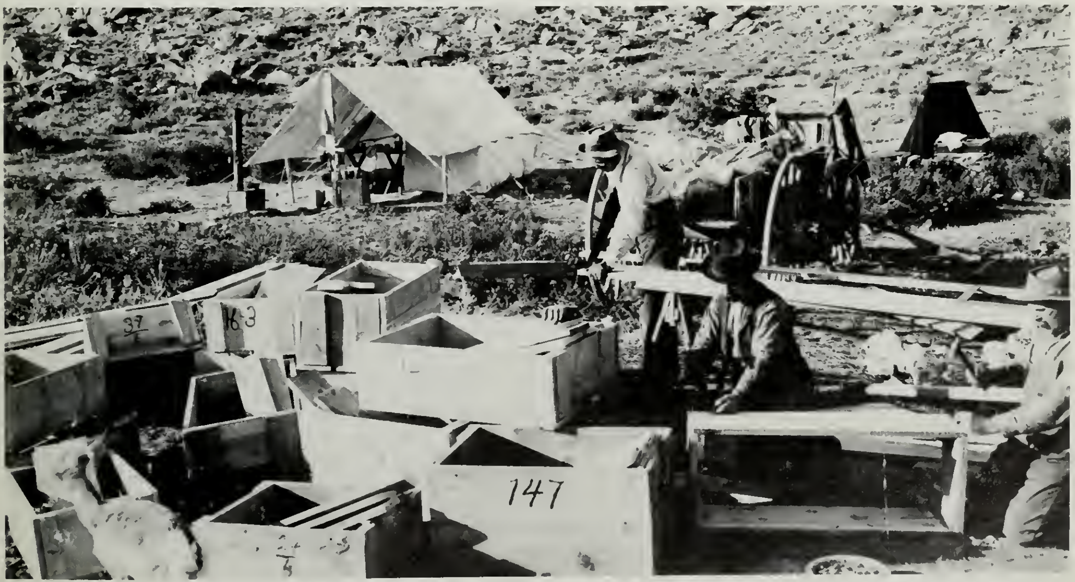
"The collections in Hall 79, devoted to ores of the base metals, have been completely reinstalled. The old cases were removed and new cases, purchased in part from the United States Commission to the Paris Exposition, substituted. These cases are constructed of mahogany and plate glass and represent a permanent style of installation. . . ."

50 years ago

From *Annual Report of the Director* for the year 1926:

"One of the most notable purchases of the year is a valuable collection of

As 1901 expedition to Colorado's dinosaur country comes to an end, workers prepare crates for shipment of giant bones back to Chicago. Black tent (above, right) is photo lab. Note wagon loaded with plaster-encased bones and pet fawn in lower right.



Chinese archaic jades, which was brought together in China by A.W. Bahr. This Collection was bought from Mr. Bahr for $75,000, towards which Mrs. George L. Smith contributed $10,000. Others who contributed funds for this purchase are Miss Kate S. Buckingham, Mrs. John J. Borland, Mr. Martin A. Ryerson, Mr. Martin C. Schwab, Mr. Julius Rosenwald, and Mr. Otto C. Doering.

"One of the last important tasks performed for the Museum by the late Carl E. Akeley was the installation of his admirable Lion Spearing Group, which was presented to the Institution by Mr. Richard T. Crane, Jr. Mr. Crane also defrayed the expense of the installation of this group."

"A gratifying manifestation of interest in the work of the Museum was displayed in the cooperation accorded by the *Chicago Daily News* in the sending of a zoological expedition to Abysinnia. The *Chicago Daily News* contributed the funds for the expenses of the expedition and sent one of its representatives with the party, whose frequent reports on its activities are being given an imposing amount of space in both that paper and associated newspapers in various parts of the country. . . . Dr. Wilfred H. Osgood is in command of this expedition, which is known as Field Museum-Chicago Daily News Expedition. . . ."

"Additions to the staff during the year [included] Mr. J. Eric Thompson, of Cambridge, England, Assistant Curator of Mexican and South American Archaeology [and] Mr. Henry Field, Assistant Curator of Physical Anthropology. . . ."

"A most noteworthy deposit in the Museum. . . was the Judge R. Magoon Barnes collection of birds' eggs. This collection was begun in 1883 as a continuation of a small boy's accumulation. Since that time, as a result of more than forty years' active and diligent effort, it has grown to be the largest and most important collection of eggs of North American birds in existence. Containing as it does, 38,731 specimens, something over 400 completed series, and nearly 500 other partial series, it represents . . . a vast amount of time and effort. There are many full series of eggs of birds now wholly unobtainable, such as the Passenger Pigeon, Whooping Crane, and Trumpeter Swan. . . .

"The Field Museum-Oxford University Joint Expedition has now been in its fourth consecutive year at the vast ruins of ancient Kish, first capital of the earliest known civilization of Western Asia. After completing the great palace of the plano-convex bricks in 1925, the more serious task of excavating the enormous group of mounds in central Kish was commenced. Two stage towers of the early Sumerian period and at least three temples lie beneath the great range of hills now known to the Arabs as Ingharra, and under the name Harsagkalama to the ancient Babylonians. Operations at the larger of these towers, or ziggurats, were started with a force of a hundred and fifty men early in the season. The temples lie west and north of this tower. One of them was partially refaced in the age of Sargon (2750 B.C.) with better brickwork than the virginal, sun-dried brick of the Sumerian structure.

25 years ago

The following items were culled from 1951 issues of the *Bulletin*:

January: "Two of the Museum's curators were retired from active duty as of December 31, 1950. They were **William J. Gerhard**, curator of insects, and **Paul C. Standley**, curator of the herbarium. As both are desirous of continuing scientific research, they will retain connection with the Museum, each having been appointed curator emeritus in his division. [Note: Gerhard died in 1958, Standley in 1963.] . . . . The vacancy in the curatorship of the Division of Insects caused by the retirement of Mr. Gerhard has been filled by appointment of **Rupert L. Wenzel** as curator of insects. Mr. Wenzel first became associated with the Museum as a volunteer assistant in the Division of Insects in 1934 while still a student. . . . **Henry S. Dybas**, assistant curator of insects, was promoted to associate curator of insects. Mr. Dybas has been associated with the Museum since 1941, beginning as assistant in the Division of Insects."

May: "**Bryan Patterson**, curator of fossil mammals, and **Orville Gilpin**, chief preparator of fossils, are afield on a paleontological expedition to explore the early Cretaceous Trinity Sands of north-central Texas in continuation of the successful search begun last year for a fossil micro-fauna.

June: **Dr. Rainer Zangerl**, curator of fossil reptiles, will accompany Professor Bernhard Peyer, director of the Zoological Museum, University of Zurich, Switzerland, on a trip to a number of famous vertebrate fossil localities in South Dakota, Wyoming, Utah, and Nevada. . . . The Museum has recently received the paleobotanical collections of the Walker Museum of the University of Chicago as a gift from that institution.

July: "An idea of the strain imposed by scientific research upon the patience and endurance of its practitioners may be obtained from the experiences of **Bryan Patterson** . . . and **Orville Gilpin**, . . . who washed and sifted more than 15 tons of sand in search of tiny, almost microscopic specimens of fossil vertebrates on their recent expedition to northern Texas. . . . The geologists returned to the Museum last month, bringing as a result of their herculean task some 1,600 pounds of concentrate. Still further sifting of this will be required to complete the work of culling the fossil specimens. . . . An expedition to collect Upper Cretaceous and Eocene fossil plants in Alabama, Mississippi, and Tennessee was begun last month by **George Langford**, curator of fossil plants, and **Dr. R.H. Whitfield**, associate in fossil plants.

October: **Miss Harriet Smith**, of the Museum's Raymond Foundation lecture staff, is on leave of absence until February 15, to make a lecture tour in schools throughout the Middle West under the auspices of The School Assembly Service. Her lecture, entitled "Treasure House," accompanied by the Museum's color film "Through These Doors," will carry the message of this institution to thousands of children and teachers in many states. . . . **Henry Dybas** . . . recently joined **Dr. Eliot Williams** of the faculty of Wabash College. . . . on an insect-collecting trip in caves of southern Indiana. They were accompanied by **Rodger Mitchell**, **Harry Nelson**, and **Eugene Ray**, who were temporarily employed in the Museum's Division of Insects during the summer. . . .

December: **Rupert L. Wenzel** left Chicago recently for an extended tour of European museums to study beetles of the family Histeridae. He will go first to Vienna to supervise the packing of the Bernhauser Collection of staphilinid beetles recently purchased by this Museum. . . . **Loren P. Woods** returned to his desk from a brief trip to southern Illinois to collect cave fishes and their relatives. **Robert F. Inger**, assistant curator of fishes, made a trip to southwestern Missouri, where he collected not only cave fishes but salamanders, crustaceans, and flatworms, all remarkable for their loss of color in the cave environment."

Members' Field Trip to Michigan's Upper Peninsula

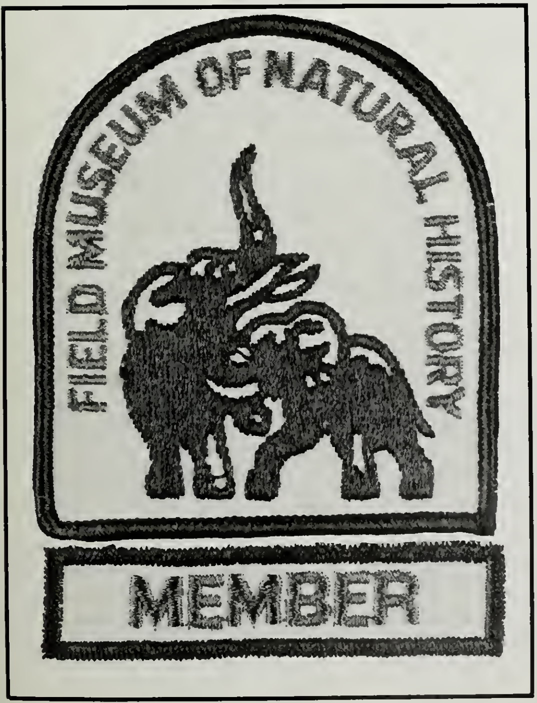
Sept. 27 through Oct. 1, 1976
5 days—4 nights

Among the most popular membership activities sponsored by Field Museum are the field trips. In the past, these excursions have usually emphasized matters of geological interest. But now the Museum is pleased to offer a geology-botany trip to Michigan's Upper Peninsula, an area of particular interest to botanists as well as to geologists.

Under the experienced leadership of Dr. Edward Olsen, chairman of the Department of Geology and a distinguished mineralogist, the group will explore localities that show the roots of an ancient Precambrian mountain chain which once stretched across this region. A visit will also be made to a working iron mine and its ore-milling operations, following the ore from rough form to pellets ready for shipment to steel mills.

Dr. William Burger, associate curator of botany, will take the group to an acid bog area and on a lecture hike through a magnificent maple-beech-hemlock forest, explaining how such plant communities arise, flourish, and are gradually replaced by other communities. Since the trees will be in the full splendor of autumn color, photography buffs will do well to bring along their cameras. Dr. Burger, past president of the Chicago Nature Camera Club, will, of course, be on hand to offer suggestions.

Cost of the 5-day, 4-night tour is $260.00 per person. This covers all transportation, as well as motel room, meals, and gratuities, based on double occupancy. A small additional fee will be charged for single accommodations. Reservations may be made by calling or writing Dorothy Roder, Membership Department, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive. The application should be accompanied by a $25.00 deposit. Phone number: 922-9410, ext. 219. The tour date is not far off, *so call or write now!*



Full-size reproduction of Field Museum's new shoulder patch, now available at the Gift Shop. Price: $2.00. Members receive a 10% discount; they also receive, free, the separate "MEMBER" strip patch, below. The background is white, the borders and elephants blue, and the lettering red-orange.

Inching Along to a Metric America

By Edward Olsen

IT BEGAN IN FRANCE in the late 18th century and spread through Europe (except England). It finally encompassed England, crept into Canada, and is now on the verge of engulfing the United States. This creeping monster is not "The Blob" of late night TV rerun fame, but the metric system.

Although metric has been allowed in the United States since 1866, and has been the official language of the core sciences, physics and chemistry, for about a century, it has been little noticed by the average person in his or her daily life. Like any slowly creeping change, most people prefer to ignore or resist it. A gentleman, Thomas Lounsbury, once quipped, "One must view with profound respect the infinite capacity of the human mind to resist the introduction of useful knowledge."

At the present time, however, one senses an uneasiness across the land. On Interstate 80 in Illinois we are mentally jolted by a sign announcing that Moline is a mere 100 kilometers away. A new Chevrolet, recently rented in Arizona, carried the usual speedometer with bold red numerals showing miles-per-hour, but also with a second band of numbers in blue informing the driver of his speed in kilometers-per-hour. A can of macaroni and cheese weighs 14¾ ounces, but its label also announces that this is 418 grams. A 12-ounce can of corn tells us it also weighs 340 grams and provides us with 6 grams of protein and 70 grams of carbohydrates. A bank in a Chicago suburb has a large sign that reports the time and temperature. During the past winter there was a break in a cold, cold week—a delightfully balmy day—and we were informed by the sign that the temperature was only 20° (Celsius, of course)! Closer to many people's hearts—we have just been informed by the federal government that by 1980 the familiar bottle-size designations of *spiritus frumenti* and other alcoholic beverages—the pint, the fifth, the magnum, and so forth—will be abandoned in favor of six sizes expressed in milliliters! Where will it all end? It will end when America goes entirely metric.

The present (English) system of weights and measures is the one with which we are all familiar—or are we really? We are used to the words, but most of us are not terribly familiar with the system itself—if we may indeed call it a "system." The word *system* usually means some logical, sensible arrangement of ideas designed so they can be easily handled and remembered. But the present English system of weights and measures is a hopeless hodgepodge that has come down to us through time from many different sources.

How many of us know the number of feet or inches in a mile? These are not some neat, round numbers, but messy numbers like 5,280 and 63,360. It isn't often we need to know those particular numbers; however, in making daily food purchases we face a word like *ounce*. But there is more than one kind of ounce (which, for some goofy reason, is abbreviated "oz" — bringing to mind, of course, Frank Baum's children's classic, *The Wizard of Ounce*!) One of the ounces is a *liquid* ounce. How many to a gallon? Another is the *dry-measure* ounce. There are supposed to be 16 of them to a pound—but this isn't completely true because it depends on the thing being sold. If you are buying a pot roast you get 16 oz. to a pound, but if you're buying gold you get 12 to a pound. One is an ounce in something unpronounceable called *avoirdupois*, and the other is something called *troy weight*. Besides this, the real horror comes in attempting to make money-saving purchases. Americans and American manufacturers are hopelessly wedded to fractional measures—and most people hate fractions anyway. We see packaged products sold with weights like 9-7/8 oz. If someone offered you a can of beans weighing this much for 40 cents, would it be a better or worse buy than a can weighing 11¾ oz. for 50 cents? The average person wouldn't have a chance of figuring out this problem even with a pocket calculator.

HOLD YOUR BREATH—it can get worse. Maybe you're the kind of person who likes to do home auto repairs. There you are, lying on the cold ground beneath your car with dirt, rust flakes, and oil falling in your face, trying to loosen a bolt. You try a wrench. It's a 13/32-inch size and just a bit too small to get around the bolt head. So, you grope around for the next size larger. It *is not*, of course, a simple problem of finding a 14/32-inch wrench because 14 and 32 are both *even* numbers. You have to do some mental arithmetic while the oil continues

Edward Olsen is curator of mineralogy.

to drip in your face. "Let's see now—2 into 14 is 7, and 2 into 32 is 16. So, the wrench I want is a 7/16-inch." Contrast this to metric wrenches and bolts. Your 10-millimeter wrench is too small so you quickly grab your 11-millimeter wrench. No arithmetic, no aggravation, fewer oil drips in the eye. It's logical, simple, and fast. Why, on earth, with such a clumsy, illogical system as the one we've been using, would we want to resist the metric system?

AS A MATTER OF FACT, most Americans could adapt to metric with little difficulty. For example, a volume of one liter is only a little more than a quart. So if you've been used to buying a quart of milk each day, a liter of milk will give you about the same amount. For purchases and cooking of food by weight, the gram or kilogram (1 kilogram = 1,000 grams) would be used. But a pound is close to half a kilogram. If you are used to cooking up two pounds of potatoes for Sunday dinner, then one kilogram will be close to what you need—it's actually two pounds and three ounces—close enough. When measuring length, the meter is only a shade more than a yard long. The meter itself is divided into 100 centimeters and each centimeter is divided into 10 millimeters. Tape measures are already being sold in centimeters with the millimeter marks on them. It's really neat! Doing home carpentry is a snap. With the present system you may want to cut a board to fit somewhere and you measure it as 20 7/16 inches—a clumsy number to remember. In metric it's a neat 52 millimeters.

Probably the only metric measure in day-to-day life that will be difficult getting used to is the temperature measure of Celsius. It is divided into 100 units with zero being the freezing point of pure water, and 100 being its boiling point. On the present Fahrenheit scale, water freezes at 32° and boils at 212°. This means, from the temperature of freezing to the temperature of boiling, there are 212 - 32 = 180 degree divisions, or roughly twice as many as on the Celsius scale. This means that the Celsius scale isn't quite as sensitive as the Fahrenheit scale to small changes. A two-degree change from, say, 88°F to 90°F is only about one degree of change on Celsius (approximately 31°C to 32°C). This means that for weather reporting it will be necessary to use decimal portions of Celsius degrees — like 31.1°C and 32.2°C. We'll get used to it; however the Fahrenheit scale has something more going for it than that. For the human being, exposed to the weather, there is nothing important about the freezing point or boiling point of water. When the outside temperature is 32°F ice forms, but the average person is not terribly uncomfortable. When the temperature finally drops to 0°F it is about as cold as anyone can stand it.

Subzero temperatures on the Fahrenheit scale are unbearable. On the other hand, when summer temperatures soar to the 90s, most people are uncomfortably hot. But when it reaches 100° F it becomes unbearable for almost everyone. So it turns out that the Fahrenheit scale is really a rough kind of comfort scale, and the numbers 0 and 100 have a sensory meaning. On the Celsius scale, the same comfort range is -17.8° C to 37.8° C, both numbers that do not convey much meaning to anyone. Nevertheless, we'll gradually get used to the Celsius scale, which comes as part of the metric package.

IN THIS COUNTRY, full use of metric is being fought by trade unions. Millions of workers own tools made in dimensions of the present system. If they all have to discard their tools and buy new ones made to metric dimensions it will cause major economic upheaval for them. They feel the federal government ought to make funds available for such conversion purchases. Although the fears of the trade unions are real, they are also exaggerated. The change-over won't happen suddenly. It will take a period of years. Industry, moreover, can be expected to cooperate. For the first batches of American manufactured goods, over an initial period of ten years, it would be simple to produce nuts, bolts, valves, etc. to metric dimensions which were close enough to the present tool dimensions so that the old tools could still be used, and gradually replaced, as they wore out, with metric ones. For example, a head bolt on an auto engine could be made at 11.1 millimeters, which is close enough to 7/16 inches that an auto mechanic could use his old wrench to remove the head. Years from now, the same bolt could be made to an even 11 millimeters, with minimal disruption. On the other hand, major tool items, like die presses, could be gradually converted to metric. But these are not items the trade workers purchase; they are machine tools used by manufacturers. Both the cost of gradual conversion of these major machines, and the cost of the average worker's tools, could be minimized by accelerated depreciation allowances on the taxes of both workers and companies. Other countries have done it. We can also.

It's amusing that in England it was not the workers who resisted the conversion—but the beer and ale drinkers, who abound in that country, transcending economic, educational—even class distinctions. The English pub-dweller's thirst is calibrated to "ha' o' pint o' bitters" or "a pint o' stout." The idea that the pint, ennobled by centuries of use, would go into oblivion along with units like the crown, the guinea, and the shilling, was too much for the otherwise facile British mind. Again, the conversion can be made quite close. The old British pint (imperial pint, that is—which is not the same as our pint, but about 20 percent larger) is 568 milliliters, or 68 milliliters (a mere 2.4 oz., imperial) more than half a liter. So, as the old mugs break they can be replaced with half-liter and quarter-liter mugs, which are within a slurp of the usual pint and half pint. Rest easy, England!

In 1975 Mr. Ford signed the Metric Conversion Act. It commits the United States to a voluntary conversion program during the next ten years. The program will include educational efforts to familiarize the public and industry with the system. It will be overseen by a seventeen-member board appointed by the president with representation from labor, manufacturing, science, engineering, state and local governments, small business, building construction, education, consumers, and concerned groups. It is designed to give everyone a say in the matter and make it as painless as possible.

AMERICANS are adaptable people. In order to survive in a metric world around us we are going to have to convert. It seems ironic that the country which was born 200 years ago by breaking away from Mother England, should be the last major nation in the world to cling tenaciously to the old, clumsy system of weights and measures—the English System! □

Our Environment

"Look-Alike" Sea Turtles To Be Treated as Endangered

Three non-endangered species of sea turtles that look like their endangered cousins have been proposed as the first species to be treated as endangered under the "Similarity of Appearance" clause of the Endangered Species Act of 1973.

The proposal would treat the green sea turtle, loggerhead sea turtle, and Pacific ridley sea turtle as "endangered" because they so closely resemble three other species already listed as endangered: the hawksbill, Atlantic ridley, and leatherback. The rulemaking is necessary because the endangered turtles cannot properly be protected from commercial exploitation since many specimens are captured each year and brought into the United States mistakenly or fraudulently labeled as belonging to one of the three look-alike species. Interested persons have until September 14, 1976, to comment on the proposal. *(See below.)*

Distinguishing between legal and illegal species is difficult in the case of adult specimens and is especially pronounced in the case of turtle parts, products, or young specimens. Expert herpetologists have acknowledged that in some instances after turtle oil is processed into perfume, turtle meat into soup, and turtle hide into shoes or leather goods, there is no way to distinguish the meat and hide of one sea turtle from that of another. Differentiation is also very difficult if the item to be identified is merely a small piece of shell as opposed to the entire carapace. Accurate identification of some young specimens is practically impossible due to the lack of distinct coloration. In fact, even in the case of complete adult specimens of the Atlantic and Pacific ridleys, differentiation is a difficult process for biologists.

The traffic in turtle parts and products is enormous and is bolstered by new uses such as turtle leather as a fashion commodity and turtle oil for cosmetics. The relatively high returns for small catches of turtle encourage both legal exploitation and poaching. Turtle products include high protein meat, hide for leather items, shell for jewelry and curios, and calipee for soup and health food preparations.

At the entry port of El Paso, Texas, approximately 10,000 turtle skins, more than 11,000 pairs of boots and shoes, and nearly 2,000 boot parts were imported in a single 6-month period from May 1975 to November 1975. At the port of Miami, shipments of more than 10 tons of turtle meat are documented. Large quantities of turtle soup, turtle oil, turtle-shell jewelry, and turtle curios also are brought in. Fish and Wildlife Service prosecutions of importers reveal that commercial dealers cannot tell the difference between the endangered and unlisted species. And when, as in the El Paso and Miami importations referred to above, identification is not possible, it is quite possible that some of the volume is composed of endangered parts and products.

At present, when the government cannot prove that a given item is from an endangered turtle, rather than from a green, loggerhead, or Pacific ridley turtle, prosecution for an Endangered Species Act violation is impossible. Yet if the item is in fact from an endangered turtle, and prosecution is prevented by its resemblance to an unlisted species, the loss of control over the endangered species is substantial. The harm to the endangered species is the same whether or not the item can be distinguished. And when this harm is repeated unchecked by prosecution for thousands of items, it poses a very real threat to the endangered species. This threat could be controlled if prosecution were made possible by treating the presently unlisted species as endangered.

Although the proposed rulemaking generally would prohibit persons subject to the jurisdiction of the United States from taking or importing green, Pacific ridley, or loggerhead sea turtles, such a prohibition should not prove to be a hardship to any private enterprise. The value of all sea turtles landed in the continental United States, about $50,000 in 1971, is insignificant in relation to overall U.S. fisheries income.

The proposal would allow the Fish and Wildlife Service and National Marine Fisheries Service to issue permits for the taking of turtles provided the applicant supplies reliable data which adequately identifies the turtles so as to distinguish them from endangered species.

Importation of sea turtles or products from foreign sources is far greater than those derived from U.S. fishermen. Imports of products identified as green sea turtle in 1970 included 113,900 pounds of meat, 25,195 pounds of calipee (used to make soup), 2,500 pounds of oil, and 2,200 skins. In 1971, almost 45,000 skins identified as Pacific ridley were imported. Such imports are probably substantially higher at present, but exact figures are unavailable.

The green, loggerhead, and Pacific ridley sea turtles were themselves proposed for the threatened species list last year by the Fish and Wildlife Service and National Marine Fisheries Service. The proposal came after a joint status review by both agencies found seriously decreased populations of these species throughout the world.

Persons wishing to comment on the current proposal should write to the Director, U.S. Fish and Wildlife Service, P.O. Box 19183, Washington, DC 20036, or to Director, National Marine Fisheries Service, Department of Commerce, Washington, DC 20235.

Dual Image for Mourning Dove

The mourning dove is a game bird. Or is it a songbird?

Actually, the mourning dove is a town and country bird wearing two hats. It means different things to residents of different states. The cooing dove is hunted in 31 of the contiguous states, according to John Ellis, a U.S. Fish and Wildlife Service biologist.

But the dove has been the subject of squabbles in 17 states where it's protected as a songbird and may not be hunted. The bird with a melancholy call leads a double life. Fact and fantasy of public opinion, which ultimately become the nuts and bolts mourning dove populations in "call-count" surveys over 800 routes chosen randomly throughout the country.

Observers who make call-count surveys listen for cooing doves at stations spaced at one-mile intervals over a 20-mile course. Each route is checked once between May 20-June 10. Ellis says the technique has been recognized as a feasible means for gathering data on changes in the dove population.

"We're in the process of conducting call-count surveys in the Great Lakes region," Ellis says. "Using this monitoring technique, we keep abreast of trends and changes in the mourning dove population."

California Cougars Not Threatened

From a study conducted by the California Department of Fish and Game, it seems that the cougar in that state is not threatened with extinction.

The study was authorized in legislation enacted in 1971 that also changed the cougar's status from a game animal to a protected nongame mammal for a four-year period and established a four-year moratorium on mountain lion hunting. The legislature in 1974 extended the moratorium to January 1, 1977.

The department has recommended that the moratorium be extended for another year while a final management plan is being completed.

The study determined there were approximately 74,000 square miles of mountain lion habitat in California with a population of about 2,400 of the big cats. Prior to that study, there had been various estimates of the lion population dating back to 1919, when 600 was the estimate.

Acid Rain Bad for Wildlife

Researchers have found that acid precipitation is seriously reducing certain species of wildlife and has ominous long-term implications for other forms of life. Acid rain is the term given atmospheric moisture laden with hydrochloric, sulfuric, and nitric acids put there by auto exhausts and the burning of other fossil fuels.

Scientists at Cornell University have documented that brook trout and other animals in the Adirondack Mountains are harmed by acid rain which has increased the acidity of lakes and streams. Acid concentrations in temporary rain pools were of legislation, have created an image problem for the mourning dove. Depending on where you raise the point, the mourning dove could be a game bird or it could be a songbird likened to the cardinal.

What is the opinion of a professional biologist, say John Ellis, who stands between the bird's two-sided image?

"The mourning dove is the most important migratory game bird in the U.S.," Ellis claims. He explains that American hunters harvest more doves than one might imagine—in fact, he adds, more than any other migratory bird species in the U.S.

"In terms of birds in the bag, hunter recreation days, and sporting interest, the mourning dove is the 'statistical champion,' " Ellis says. Though the statistics may surprise many people, the champion of sorts is not a contender for regal sporting honors in the Great Lakes region. Regionally, the trim bird is hunted only in Illinois and Ohio.

Mourning dove populations are susceptible to high annual losses from natural mortality. Surplus birds are squandered in the natural process, a fact that fuels the ire of many sportsmen who do not have an opportunity to harvest doves. Despite losses to natural mortality, the dove population rebounds with good nesting vigor each year, averaging two eggs per nest. Ellis says that clutches of two or three eggs are not uncommon in dove production areas.

Mourning doves, he observes, are hunted over 73 percent of the land in the lower 48 states. He also notes that sportsmen hunt 74 percent of the "current breeding population."

"When there is a good breeding population, there is no biological reason to prohibit hunting," Ellis suggests. "But it boils down to more than biology, because public sentiment has been a big factor in the management of the species."

Although opinions on the mourning dove vary across the land, data indicate the dove could be hunted in most states without apparent harm to the cooing population. High dove densities occur from North Dakota to Oklahoma, and in portions of the Southern Great Plains and adjacent lowlands. Lesser breeding populations, though huntable, are distributed along the Continental Divide, the Great Basin, and through most of the Northern Appalachian and Great Lakes states.

Working cooperatively with the states, the Fish and Wildlife Service, charged with managing migratory birds, monitors found to be exceptionally high. Frogs, toads, and salamanders use those temporary ponds to breed and are most susceptible to the pollutants.

Researchers at the University of Minnesota point out that acid damage to trout and salmon fisheries in Scandinavia has been "devastating." They say the acidity there probably can be traced to European industrial pollution and the resultant acid rains falling into streams and lakes. They said that human diseases have not been traced to acid rain, but there is evidence to cause concern.

Court Rules for "Natural" Beauty

A Wisconsin circuit judge has ruled that the town of New Berlin's weed and grass control ordinance is unconstitutional. This earth-shattering decision means that Donald Hagar, a wildlife biologist, can let part of his yard revert to native grasses to benefit wildlife.

Hagar's "wildlife habitat" had violated a town ordinance which said weeds and grass "in any recorded subdivision" could not exceed 12 inches in height. Judge William Graming ruled that Hagar could continue cultivating his yard "sensitive to the environment and wildlife."

Vitamin C Aids Fish

Scientists have known for years that fish use vitamin C for proper bone growth and to increase their tolerance to environmental stresses. Yet, they never knew exactly how this occurred. Now they do, and the discovery may help biologists better combat the effects of pollution on fish.

Biologists at the U.S. Fish and Wildlife Service's Fish Pesticide Laboratory in Columbia, Missouri, first learned of the mechanism while studying channel catfish that were affected by the insecticide toxaphene. This pesticide is widely used on cotton crops in the South where channel catfish are also raised commercially.

About six years ago, biologists noticed that the channel catfish grown on fish farms in that area were developing a curvature of the spine that, in extreme cases, broke the fish's back and stunted growth as much as one-third. Last year, Fish and Wildlife Service scientists linked this syndrome to toxaphene residues in the water. Concentrations as low as 37 parts per trillion in the water were found to have serious ➤

long-term effects on catfish. Earlier this year, they documented for the first time the specific role vitamin C plays in this process, and the implications are significant for future fish culture as well as for better understanding of the chronic effects of pollutants on fish.

The mechanism works this way: Vitamin C is used by fish in a number of ways and in various parts of the body. One primary function of the vitamin is to aid in the formation of collagen—the protein framework, or base, upon which bone develops. Calcium and phosphate minerals are deposited within and around this framework, forming a skeleton. An insufficient supply of vitamin C can increase the mineral ratio, making the backbone brittle and finally snapping it, which can result in internal bleeding. If the fish survives, its growth is severely stunted. In addition, with a decrease of collagen, the ability of fish to heal wounds or regenerate tissue is affected. Finally, vitamin C is an essential nutrient of the liver and is used as a key defense to detoxify poisonous substances in the environment. Without it, fish cannot respond as well nor adapt to stresses.

Biologists at the service's Fish Pesticide Research Laboratory found that when catfish were chronically exposed to toxaphene residues, even in trace amounts, their ability to form collagen was inhibited. Research showed that most of the vitamin C is diverted to the liver, where it is used to neutralize the effect of toxaphene. So much of it is diverted that there isn't enough of the nutrient left for other metabolic processes.

The result is a functional deficiency of the vitamin, even though the amount may be the same as in a healthy fish, and reduced growth and the broken back condition can occur. Brook trout and fathead minnows exhibit similar symptoms when exposed to low concentrations of toxaphene.

Although there is no known method to increase the vitamin C content of fish in the wild, the discovery of its importance in fish metabolism has been quite beneficial to the multi-million dollar fish farming business of the South where up to 5 percent of pond-cultured catfish showed the symptom. Vitamin C is now included in many commercially prepared fish foods and its inclusion in the diet of farmed catfish is helping to eliminate the "broken back syndrome."

However, the discovery of vitamin C's importance in fish metabolism is equally beneficial to biologists studying the chronic effects of pollutants. Biologists believe that the mechanism which fish use in detoxifying toxaphene is the same used to neutralize the effects of other pollutants, but further studies are necessary before any firm conclusions can be drawn.

Critical Habitat for Tennessee Fish Species

Critical habitat for the snail darter, a three-inch-long species of fish discovered in Tennessee in 1973, has recently been determined by the U.S. Fish and Wildlife Service. The snail darter, *Percina tanasi,* occupies a 17-mile stretch on the Little Tennessee River in Loudon County, Tennessee. It inhabits only portions of clean, gravel shoals with cool, swift, low-turbidity water. The food of the snail darter is almost exclusively snails which are abundant on these shoals and which also require clean gravel bottom for their survival.

One consideration used in determining the endangered status that was given to the fish last fall was the threatened destruction or modification of its habitat and range.

FWS was determined that impoundment of water behind the Tennessee Valley Authority's proposed Tellico Dam would result in the total destruction of the snail darter's present known habitat and eventually cause the last natural occurring population of the fish in the wild to be destroyed. The dam project, underway for about eight years, is more than half completed.

Several specimens of the species have been transplanted to the Hiwassee River, a tributary of the Tennessee River, and appear to be doing well. However, biologists believe it will take several years before they know for sure if the transplanted population survives and reproduces.

Proposed Regulations Would Aid Breeders of Endangered Species

Zoos, circuses, game bird breeders, and other persons who breed endangered species in captivity will be helped by new regulations proposed by the U.S. Fish and Wildlife Service. The regulations, proposed recently in the *Federal Register,* simplify the process of transferring ownership of certain endangered species which are being bred in captivity. Sixteen species, four of them native to the United States, are found to be bred extensively enough in this country that they are being proposed as "captive, self-sustaining populations."

"These breeders play a vital role in the conservation of endangered species," says an FWS spokesman. "In fact, if it weren't for them, some species that are no longer found in the wild would be extinct. These captive populations not only provide gene pools which, of themselves, are worthy of preservation; they also make possible the reestablishment and rejuvenation of wild populations as well as man's continued, legitimate use and enjoyment of the species without jeopardizing its existence.

"For example, there are almost 300 tigers in captivity in the United States. Of these, only about 10 came from the wild—all the rest were bred here and more than 25 individuals have been able to breed them."

The proposal recognizes that a species may be critically endangered in the wild, but through the efforts of zoos or other propagators, is being bred in *captivity* in such numbers that a captive population capable of perpetuating itself has been established. In most cases, the continued existence of the "captive, self-sustaining population" is dependent upon the ability of institutions to quickly transfer ownership of breeding stock and surplus animals among themselves. Effective husbandry requires that breeding season, weather, compatibility of animals, and other uncontrollable factors be considered in movement of animals.

The proposed regulations would determine that "captive, self-sustaining populations" of the following endangered species have been attained in the United States: tiger, leopard, jaguar, ring-tailed lemur, black lemur, brown-eared pheasant, Edward's pheasant, Humes pheasant (bar-tailed pheasant), Mikado pheasant, Palawan peacock pheasant, Swinhoe pheasant, white-eared pheasant, Nene goose (Hawaiian goose), Hawaiian duck, Laysan teal (Laysan duck), and masked bobwhite (masked bobwhite quail). The regulations would set up a greatly simplified system of permitting qualified persons to buy or sell these species for purposes that would *not* result in the import, export, or death of the animal or the loss of its reproductive ability. The regulations also provide for a recordkeeping system sufficient to enable the service to monitor the well-being of the captive populations.

The service considered data provided largely by the American Game Bird Breeders Cooperative Federation and the International Species Inventory System of the American Association of Zoological Parks and Aquariums in making these proposals.

Wild Horse And Burro Decision Reversed

The U.S. Supreme Court has overruled a lower court decision which had declared the Wild Horse and Burro Act of 1971 unconstitutional. The case involved action brought by the New Mexico Livestock Board declaring that the act infringes on state authority. The board had rounded up and sold at public auction burros allegedly molesting cattle on national resource land covered by grazing permits. After the sale, the Bureau of Land Management asserted jurisdiction and demanded that the animals be returned to the public lands.

Speaking for the court, Justice Thurgood Marshall said that Congress has adequate authority under the property clause of the Constitution to enact such legislation. That clause provides that "Congress shall have power to dispose of and make all needful rules and regulations respecting the territory or other property belonging to the United States."

The Livestock Board had argued that burros are neither federal property nor public lands and thus outside the scope of legislative power under the property clause. The court held that Congress exercises "complete power" over public property and that such authority "necessarily includes the power to regulate and protect the wildlife living there."

The court swept aside the board's contention that the act violates traditional state power over wild animals by stating that state powers exist only "in so far as their exercise may not be incompatible with, or restrained by, the rights conveyed to the federal government by the Constitution."

The International Association of Fish and Wildlife Agencies filed an amicus curiae brief in the Supreme Court, taking the position that the burros were feral animals, not wildlife, and that the court need not address the question of federal-state authority over wildlife on the public lands. The court, however, failed to draw a distinction and the decision does speak to federal-state wildlife authority. The decision changes little since Congress already has exerted such authority as it did in the 1973 Endangered Species Act.

Bighorns Losing to Burros?

Bighorn sheep near Lake Havasu, Arizona, are losing a battle with feral burros for a place to live, according to the Wildlife Management Institute. A recent helicopter survey of the area by the Arizona Game and Fish Department disclosed more than twice as many burros as bighorn sheep. The department estimates that the approximately 450 burros in the area are multiplying at a 20 to 25 percent annual rate, far faster than the sheep. Experts say that is because the survival rate for burro foals is almost 100 percent and that of bighorn lambs is rarely more than 20 percent.

Competition between burros and bighorn for forage and water has been extremely tough on the sheep. Burros will physically defend a waterhole from other animals. They easily displace bighorns from water and feed sources. Authorities say that during the colder months sheep get water they need from plants. But during the summer, waterholes may mean the difference between life and death, and the ever-increasing number of burros maintain year-round control of the watering places.

Managers say that not much can be done about the burros at present because of ill-conceived protective provisions of the Wild Horse and Burro Act of 1971. There is no federal law to help the bighorn until their population has been reduced to a threatened or endangered status.

Peregrine Falcons Restocked

Close to 30 peregrine falcons—an endangered species—were released into the wild in Colorado and five Eastern States this summer by the Interior Department's U.S. Fish and Wildlife Service, Cornell University, and the States involved.

The birds were released in New York, New Hampshire, Pennsylvania, New Jersey, and Maryland. Also, four birds were released in Colorado along the eastern slope of the Rockies where they have dwindled in recent years. The exact locations are not being announced because a trial effort in 1974 resulted in the shooting of several birds by people who don't like falcons.

The peregrine falcon was killed off by DDT and by auto exhaust east of the Mississippi River by the early 1960s. The auto exhaust and DDT picture has improved to the point where scientists now believe the birds can live a healthy life.

Last year, 16 peregrine falcons were released in the wild along the East Coast and 12 of them survived. Two of the falcons were killed in fights with their natural enemy, the great horned owl. A third, placed at the site where the other two were killed by the owls, was recaptured and brought back to the breeding lab at Cornell University, so the owls wouldn't kill it, too. The fourth bird lost was killed by electrocution when it hit a power line.

The 12 success stories, though, are very heartening to scientists involved in this project. The birds have not only adapted admirably to the wild and found adequate food supplies, but, more important, they have not migrated to Latin America or elsewhere during their first year.

This was one of the unknowns when the experiment was begun last year. Many falcon species do migrate when weather conditions force them off Arctic and far-north breeding grounds. They head as far south as Latin America each year. However, they pick up considerable pollution from DDT and other pesticides in use in many of the countries to the south.

The 16 birds that were released last year were bred and reared in captivity by scientists at Cornell University's Ornithology Laboratory. The scientific theory they wanted to test concerned the migratory instinct in these birds. They believed that birds would not migrate north of their birthplace, because they would identify the length of daylight hours and the movement and position of the sun as characteristic of their home territory.

The theory seems to have been borne out after a year of detailed radio tracking of the 16 birds. They have shown a tendency to migrate, but it is from west to east. Released inland over New York and other Eastern States, the falcons move east with the autumn weather and the appearance of waterfowl—a food supply—in great numbers along the coast. They did not head south with the onset of winter, but, instead, survived well along the coast.

This year's release program was begun in early June. Four birds were released in Pennsylvania, three in New York, six in New Hampshire, seven in Maryland, four in New Jersey, and four in Colorado. ➤

These, of course, are in addition to the 12 survivors of last year's experiment. The species being restocked in the old haunts of the rock peregrine is not the same bird that once lived there. The rock peregrine was never scientifically identified as a different subspecies, but is considered to have been a different race of peregrine falcon than the American peregrine. Regrettably, there are none like it left in the world. The American peregrine falcons being released under this program are of a different build, plumage, and migratory behavior than the original inhabitants of that ecological niche.

As last year's experiment showed, this subspecies is the most likely replacement for the rock peregrine.

Bald Eagle Proposed For Endangered List

The bald eagle, symbol of the Nation, representative of courage, strength, and independence, has been proposed for listing as endangered in 43 states and as threatened in five others.

Many people believe the bald eagle is already listed as endangered. The species is protected by the Bald Eagle Protection Act of 1940, but only the southern subspecies is listed as endangered. The proposal, published in the July 12 *Federal Register*, would provide maximum protection for the species by extending the coverage of the Endangered Species Act of 1973 to all bald eagles in the continental United States. (Bald eagles do not occur in Hawaii, and their population in Alaska is considered healthy.) The 1973 Act prohibits any federal agency from authorizing, funding, or carrying out any action that would jeopardize the existence of listed species.

Endangered species receive complete federal protection. None can be killed, placed into commerce, or possessed without a special permit. Permits are given only for scientific purposes or to enhance the propagation or survival of the animal. Threatened species regulations can be as stringent as endangered species controls, or more relaxed.

For the convenience of wildlife managers, bald eagles have been arbitrarily separated into two subspecies with 40 degrees north latitude dividing the northern and southern breeding populations. The southern subspecies was listed as endangered when the first list was compiled in 1967, with the northern subspecies remaining unlisted. However, confusion has resulted, since the two populations have overlapping ranges. The current rulemaking resolves this problem by simply listing the species, *Haliacetus leucocephalus,* as endangered in the "lower" 48 states except in Minnesota, Wisconsin, Michigan, Oregon, and Washington, where it would be listed as threatened.

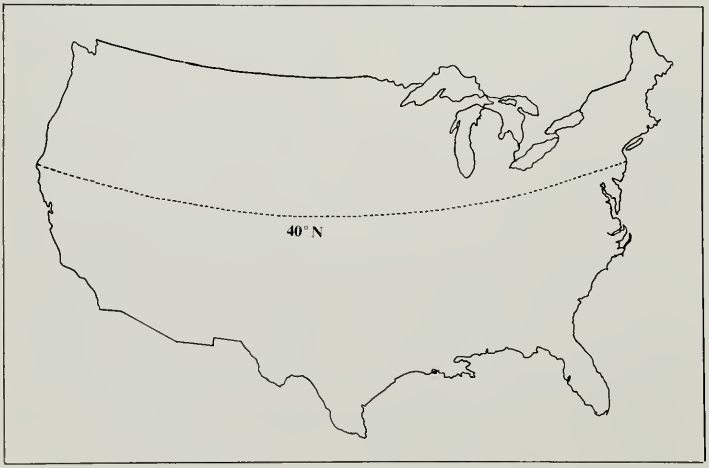
The proposed listing of the bald eagle as endangered in some states and threatened in others expresses the biological conditions in these respective areas. While the outlook for the species is not bad in every state, and some regions have even experienced encouraging increases, existing populations are believed to be depleted enough to warrant the additional protection of the Endangered Species Act. A provision of this law would help slow further deterioration of this species' critical habitat.

Losses of eagle habitat have been particularly severe in the lower Great Lakes region, New York, and New England. Only a single nesting pair of bald eagles remains in New York state where they used to be common, and this pair didn't produce any offspring last year. The 33 pairs in Maine produced only 14 offspring.

Shooting continues to be the leading cause of premature death among adult and immature bald eagles and accounts for 40 to 50 percent of birds picked up by Fish and Wildlife field personnel. Some people misidentify them for other species while hunting and others deliberately kill them because of an ingrained prejudice against all birds of prey.

There is still much hope for the bald eagle, however. While in the entire "lower 48" there are only about 700 active nests, the population in Alaska is thriving with an estimated 10,000 nesting pairs. In the upper Great Lakes region and on the Pacific Coast, eagle populations currently appear to be maintaining themselves. Fish and Wildlife Service biologists working with state game and fish agencies have for the last two years successfully transplanted bald eagle eggs from healthy nests in Wisconsin and Minnesota to nests in Maine where eagles are riddled with pesticides. The species has also benefited from programs such as captive breeding, monitoring, and other research conducted at state and federal facilities.

Bald eagles have been arbitrarily separated into two subspecies, with 40 degrees north latitude dividing the northern and southern breeding populations.



J. Francis MacBride, 1891-1976

J. Francis MacBride, a Field Museum curator for more than 34 years, died on June 15 in Riverside, California, at the age of 85. He was born in Rock Valley, Iowa, in 1891 and came to Field Museum in 1922 as assistant curator of botany. In 1936 he was named associate curator and in 1945 he became curator, Peruvian botany. MacBride retired from his post in 1956.

SEPTEMBER at Field Museum

NEW EXHIBIT

Male and Female: An Anthropology Game. The popular Members' Nights activity is now a special exhibit. Approximately 30 anthropological artifacts from all over the world are on exhibit in the South Lounge. Visitors have the opportunity of guessing whether these objects were used by men, women, or both. Careful—it's not as easy as it looks!

NEW PROGRAM

Autumn Journey for Children: My Kind of Town. September 1 thru November 30. A free, self-guided tour about the geology, early history, and animals of the Chicago area. All children who can read and write are invited to participate. Journey sheets are available at the information booth. Bring pen or pencil.

SPECIAL EXHIBITS

Man in His Environment. This unique exhibit takes a global view of some of the most serious environmental problems now confronting all mankind and asks visitors to involve themselves in these problems—and the need for solution. A salt marsh—recreating one at Sapelo Island, Georgia—offers a unique opportunity to study basic ecological principles within a total marsh environment. *Hall 18.*

Pliny's Natural History: The First Encyclopedia. In an attempt to bring together all the knowledge of the ancient world, Pliny, the Roman (AD 23-79) compiled what has been called the first encyclopedia—viewed today as an astonishing mixture of fact and fiction. Two rare editions (printed in 1513 and 1530) of this work, now among many other rare works in the Field Museum Library, are currently on exhibit in the South Lounge.

Pterosaur. An aluminum and fabric stylized model of the largest known flying creature—an extinct pterosaur—spreads its wings across Stanley Field Hall to dramatize a special exhibit of pterosaur fossils in the northwest arcade, second floor.

LAST CHANCE TO SEE

Between Friends/Entre Amis. Canada's gift to the American people on the occasion of our Bicentennial—a documentary exhibit of 220 superb color photographs taken along the entire United States/Canadian border. Produced by the Still Photography Division, National Film Board of Canada, the exhibit encompasses the land and the people along the 5,525-mile stretch. *Hall 26 to September 7.*

SPECIAL PROGRAM

Man in His Environment Film Series. Now in its third and final cycle. The best and the newest environmental films are offered in conjunction with the museum's major new exhibit: *Man in His Environment.* Many of the films have never been shown at the Field Museum before. Films are shown at 11:00 a.m. and 1:00 p.m. in the Meeting Room, second floor north. All programs run approximately 1 hour.

The September theme is "Adaptations for Survival: Relationships of Certain Animals to Each Other and to the Environment."

Sept. 3, 4, 5:	*Cry Wolf* *Deadly African Snakes*
Sept. 10, 11, 12:	*Sea Turtles* *The Octopus*
Sept. 17, 18, 19:	*The Spider* *Private Life of the Herring Gull*
Sept. 24, 25, 26:	*Private Life of the Gray Seal* *Mayfly: Ecology of an Aquatic Insect*

(CALENDAR continued on back cover)

SEPTEMBER at Field Museum

(CALENDAR continued from inside back cover)

CONTINUING PROGRAMS

Saturday Discovery Program. Tours, demonstrations, and participatory activities are offered every Saturday from 11:00 a.m. to 3:00 p.m. Topics vary but often include:

> *Cahokia Archaeology*—Discover an ancient Illinois civilization. A brief glimpse into the largest society north of Central America in Pre-Columbian times.
>
> *Dinosaurs*—Visit the Hall of Dinosaurs and make a clay dinosaur to take home.
>
> *Ancient Egypt*—A half-hour tour through the Egyptian collection, including an explanation of the hows and whys of mummy-making.
>
> *Illinois Archaeology*—An overview of the field archaeological techniques featuring a full-size model excavation, slides, and artifacts. Discussion includes cultural development in Illinois from 8,000 B.C. up to the historic period.
>
> *Snakes*—Live snakes are featured in the Hall of Reptiles and Amphibians.

For specific programs and times, phone the museum or inquire on arrival at museum entrances.

SPECIAL-INTEREST MEETINGS OPEN TO THE PUBLIC

Sept. 7, 7:30 p.m.	**Kennicott Club**
Sept. 8, 7:00 p.m.	**Chicago Ornithological Society**
7:30 p.m.	**Windy City Grotto, National Speleological Society**
Sept. 9, 8:00 p.m.	**Chicago Mountaineering Club**
Sept. 12, 2:00 p.m.	**Chicago Shell Club**
Sept. 14, 7:30 p.m.	**Nature Camera Club**
Sept. 16, 8:00 p.m.	**Illinois Mycological Association**
Sept. 21, 7:30 p.m.	**Chicago Audubon Society**

COMING ATTRACTIONS

Edward E. Ayer Film/Lecture Series. To mark the opening of the west entrance and the reopening of Simpson Theatre, the museum is offering a film/lecture series of superior quality. Join us each Saturday, October 2 through November 27, at 2:30 p.m. in Simpson Theatre.

Oct. 2:	Curtis Nagel: *Our Enchanted Islands of Hawaii*
9:	Edward M. Brigham: *Wilderness '76*
16:	Andre de la Varre, Jr.: *Grand Rhine Alpine Journey*
23:	Dennis Glen Cooper: *Isle Royale*
30:	Dick Reddy: *Mark Twain in Italy*
Nov. 6:	Kenneth Armstrong: *Australia—Great Land Down Under*
13:	John Goddard: *Exploring African Wonderlands*
20:	Ted Walker: *The Sea and Shore of Baja*
27:	Quentin Keynes: *Search for the Twisting Makonde*

Adult Education Courses—Autumn Series. Natural history and anthropology noncredit courses are being offered to ages 18 and over beginning in October. Watch your mailbox for a special Adult Education Courses brochure. We recommend that you register early because class enrollment is limited.

SEPTEMBER HOURS

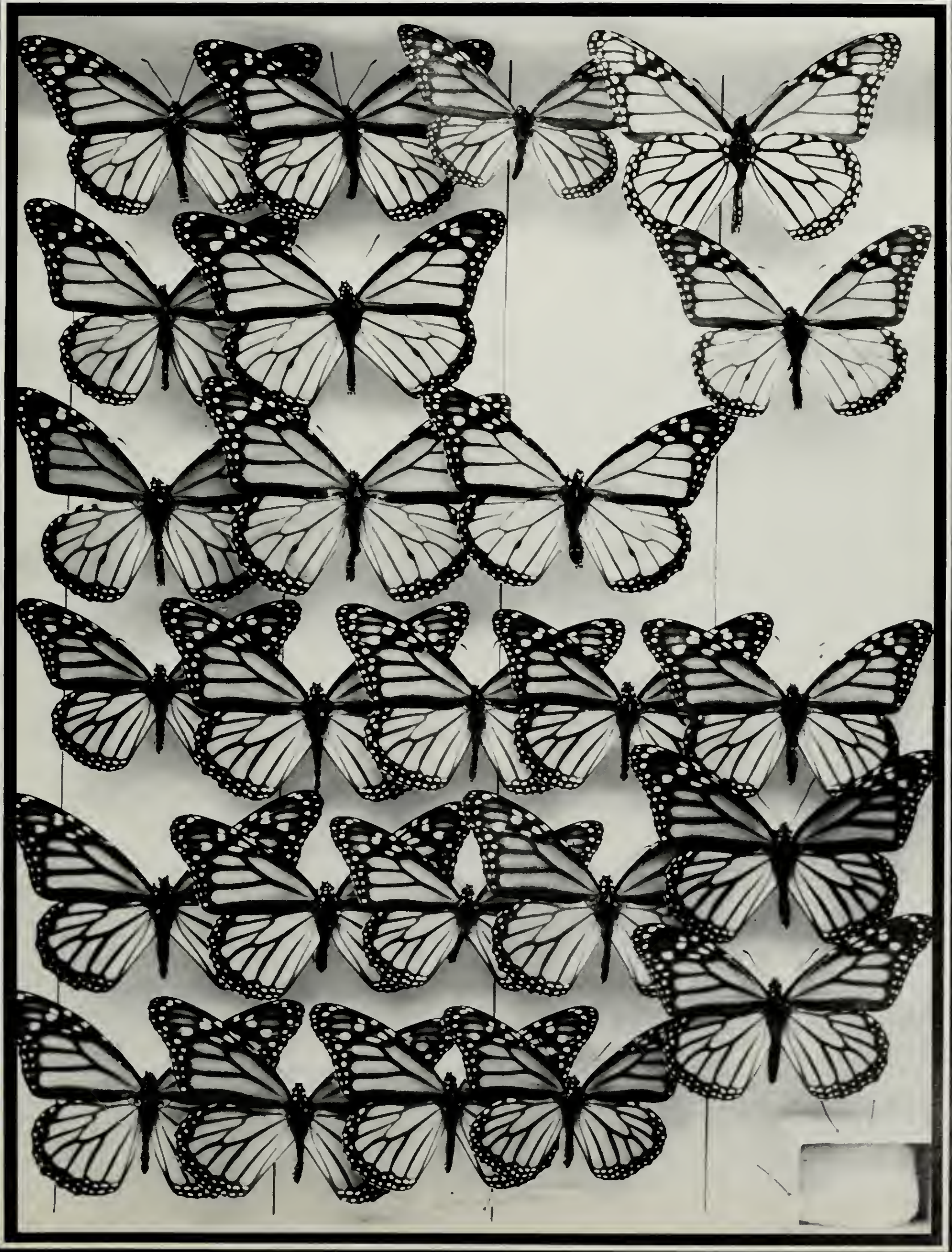
THE MUSEUM opens daily at 9:00 a.m. and closes at 5:00 p.m. every day except Friday. On Friday, year-round, the museum is open to 9:00 p.m. Food service areas are open weekdays 11:00 a.m. to 3:00 p.m.; weekends to 4:00 p.m.

THE MUSEUM LIBRARY is open 9:00 a.m. to 4:00 p.m. Monday through Friday (closed September 6). Please obtain pass at reception desk, first floor north.

MUSEUM TELEPHONE: 922-9410.

October
1976

Field Museum of Natural History Bulletin



Field Museum of Natural History Bulletin

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Field Museum of Natural History

Founded 1893

President and Director: **E. Leland Webber**

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CONTENTS

3 **The Field Museum-Street Peruvian Expedition, 1976**

A report on the recent five-month collecting trip by Field Museum mammalogists

By John J. Pizzimenti, assistant curator of mammals

10 **Field Briefs**

11 **Members' Tours to Egypt**

12 **Sahara: The Growing Giant**
The relentless advance of earth's largest desert is a complex and disturbing phenomenon

By Burt and Susan Ovrut

19 **October at Field Museum**
Calendar of coming events

COVER

*Specimens of the monarch butterfly (*Danaus plexippus*) in the Field Museum insect collection. The monarch easily qualifies as Illinois' most widely recognized butterfly species. Abundant throughout the state, it has been observed as early as April 20 in Illinois and as late as November 13. Its larvae feed only on milkweed, a widely occurring group of which more than 100 species are known to occur in North America. It is from this food plant that the monarch elaborates a substance poisonous to vertebrates. The poison, recognized as a type of cardiac glycoside, or cardenolide, is a powerful heart drug that will also induce vomiting in birds. A couple of good-sized bites from a monarch wing (where the poison is most concentrated) are enough to make a bird very sick—and teach him to avoid the butterfly in the future.*

One year ago—on October 1, 1975—the Illinois legislature passed a bill recognizing the monarch as the state's official insect, thus gaining for the butterfly the same symbol status as the cardinal, oak, violet, and fluorite (official state bird, tree, flower, and mineral, respectively). Much of the credit for promoting the bill goes to Mary L. Hinman, a Decatur, Illinois, schoolteacher.

October is an appropriate month to honor the monarch, for it is then particularly in evidence. Before freezing weather arrives, monarchs hatched in late summer head for their respective wintering regions. Most monarchs seen in Illinois migrate to recently discovered wintering grounds at an elevation of 9,000 feet in a remote part of the Sierra Madre, north of Mexico City. A portion of the monarch population of eastern United States heads for Mexico's Yucatan Peninsula; the western population winters along the California coast between Monterey and Los Angeles. In springtime the butterflies head northward again. Some individuals travel to Mexico from as far away as Canada's Maritime Provinces.

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In camp, on the western slopes of the Andes, expedition members Mike Mortimer, Bill Street, and "Rolo" Estrada await their evening meal.

The Field Museum-Street Peruvian Zoological Expedition, 1976

By John J. Pizzimenti

Photos by the author

Peru! Land of the Incas. Home of llamas, alpacas, and vicunas. Where Indians labor up to 16,000 feet and show little effect from the altitude. These were some of my impressions of a country I'd not yet visited. And long before I had finished five months of field work in the Peruvian Andes, these impressions along with hundreds of others became part of an experience I'll long remember.

The Andes of southern Peru, one of the most impressive mountain areas in the world, are starkly beautiful—almost treeless. Rising abruptly from a coastal, nearly absolute desert, they reach altitudes usually associated with commercial jet liners, not pack animals. Because of the intricate physiography and complex climatic patterns of Peru, a myriad of diverse habitats exists within a country geographically similar to (but about three times the size of) the state of California. The diversity provides a wealth of "natural experiments" in which scientists can study geographical and ecological variation of animal populations; these, in turn, give us greater understanding of the processes of evolution. The fauna of this region was, in fact, of great importance to Charles Darwin in his formulation of the theory of evolution more than a century ago. And it was a small South American mouse, *Phyllotis darwini,* discovered by, and named after Charles Darwin, that brought the Field Museum-Street Zoological Expedition of 1976 to Peru.

William S. and Janice Street, for whom the expedition was conamed, provided much of the financial support for the expedition; support was also provided by the National Science Foundation as well as by Field Museum. The Streets were also ►

John Pizzimenti is assistant curator of mammals

El Misti, an active volcano, resembles Japan's Fujiyama as it rises to more than 19,100 feet in southern Peru—more than a mile higher than its Japanese counterpart. In the foreground is puna vegetation, typical of the Peruvian altiplano.

particularly helpful during the initial preparations and arrangements, and subsequent in-the-field physical adjustments that are part of all expeditions abroad. Bill Street's diplomatic talents and globe-trotting experience were invaluable in obtaining official assistance in Washington D.C. and Lima. (Street is a retired corporation executive and served for a time as president of Frederick and Nelson, a division of Marshall Field and Company.) Through his contacts our expedition was afforded the greatest courtesies and assistance from a variety of sources. In particular, Marshall Field and Company and Northwest Orient Airlines were most helpful in the logistics of the expedition.

Scientific expeditions are no new experience for the Streets. They have led major field parties to such remote areas of the world as Afghanistan, Nepal, and Iran, and they are now in the "outback" of western Australia on the largest Field Museum expedition in recent history. (See June, 1976, *Bulletin,* p. 8.)

On January 7, field assistant Mike Mortimer and I were met in Lima by Peruvian mammalogist Hernando de Macedo of Museo de Historia Natural. Dr. de Macedo helped launch the expedition from Lima and introduced us to Rolando Estrada, a Peruvian biologist who joined us there. The Streets arrived a few days later and assisted in the final preparations needed for living and working in the Andes. (*Homo sapiens* did not evolve on a 13,000 foot slope!).

We set out to scout our first base camp in the Rimac Valley, not far from coastal Lima. The Rimac River descends more than 14,000 feet in about 50 miles—attesting to the steepness of the western slopes. We drove to over 13,000 feet near the top of the valley in about three hours and soon discovered the meaning of the local term "suroche." Altitude sickness! My companions told me I looked green, but their complexions also seemed sallow. We decided to camp about half way up the valley, where we worked the middle elevations of the Rimac and adjacent Santa Eulalia valleys. Here we trapped several species of *Phyllotis* as well as rice rats (*Oryzomys*), which are adapted to agricultural habitats.

Phyllotis darwini, commonly known as the leaf-ear mouse, is part of a group of

The Peruvian Zoological Expedition is an excellent example of the joining of Field Museum resources with the contribution of funds and time by talented and interested donor-members of the Museum. During the last 15 years the William S. Streets have contributed to and participated in six major Field Museum expeditions. As a result, collections have been built, research on the collections has been published, and a number of young persons have been advanced in their graduate training for professional careers in biology.

We wish to express appreciation to Mr. and Mrs. Street for their great contributions to Field Museum and to biological knowledge. At the same time we commend their example as one that we hope other members of the Museum may wish to emulate. The staff and I will be happy to discuss opportunities for field participation with prospective donors at any time.

E. Leland Webber
President

twelve similar species which inhabit the Andes from Ecuador to Tierra del Fuego, at the southern tip of the continent. Although most species of *Phyllotis* are easily identified by color, size, or other external features, a few are difficult to distinguish except by internal or genetic characteristics. Close similarity between two species may be due to recent speciation (one species splitting into two) or because of an evolutionary process called "convergence." Since evolution is a process of genetic and morphological, or structural, change in populations over a period of time, it is possible for two species to "diverge" (become dissimilar), especially if they occupy different environments, or "converge" (become more similar) if they occupy environments that are similar. Since evolutionary changes are usually very slow (often taking hundreds or thousands of years), an approach which looks at variation through space (not time) was employed in our study of this process and how it relates to the environment.

In looking at populations in different localities and different environments, similarities and differences soon become obvious to even the untrained eye—one need only look at the diversity of morphology in the human species to gain some appreciation of adaptation to different environments. The main purpose, then, of our Peru expedition was to study the different populations and species of the leaf-ear mouse in as many different environments and localities as possible. By collecting data on the mice, as well as on their habitats, I hoped to demonstrate changes in morphology and genetics of the animals that were correlated with changes in their biotic and abiotic environments. This goal may be intuitively logical and simple to understand, but it has rarely been achieved in evolutionary studies; the reason for this is the broad data base necessary to glean the evidence needed, and because populations rarely change dramatically in response to a simple and obvious environmental factor.

The methods we employed were standarized for the whole expedition so that data from each locality could be compared with that from every other locality. Live traps and snap-type traps baited with oats were set in lines of 25 stations, at 10-meter intervals, to sample the populations over a period of several days. Live-trapped individuals were needed to provide samples of proteins from blood and organs such as the liver and kidney, and to make microscope slides for karyotype studies, which involve the comparison of chromosomes. The protein and chromosome data would be used in studying the genetic or genealogical relationships among the different populations. Snap-trapped individuals were necessary to study the stomach contents and thus learn about the food preferences of each species.

We also collected and preserved ectoparasites such as fleas, ticks, and mites from most specimens and preserved the skins and skeletons of all the rodents for analyses of morphological variation. (These studies are now underway in our laboratories at Field Museum.)

Tally sheets were always maintained for our traplines so that we would know exactly where and when each individual was captured; this would enable us to later calculate population densities for each species. The information thus gained would be important in analyzing competition between the different rodent species and in determining how environmental resources were partitioned by the community. Some species were trapped at night, others only during the day; a few ➤

William S. Street

were active 24 hours a day. Some preferred a rocky habitat, others preferred the stone walls of llama corrals, and still others were to be found in the open, grassy hilltops. All these data would eventually provide a clearer picture of the ecological niche of each competing species, and each trap record added one more piece to the evolutionary and ecological puzzle I was trying to solve.

Before completing our studies at each locality, we carefully measured and collected samples of the different plant species along the traplines. The plants would be useful for comparison of stomach contents and would also be used to test my hypothesis that plant diversity would be significantly correlated with rodent diversity at the different localities. Detailed information on other factors such as the type of soil or rock, the degree of slope, and any other item that might appear significant in the ecology of the rodent community was noted at the same time.

From the Rimac Valley we traveled south along the coastal desert and trapped *Phyllotis* and *Oryzomys* in several river valleys and lomas—patches of vegetation which survive primarily on moisture from fog along the coast; these appear as jade-green oases in the desert of rock and sand. Intervals of ten years or more between rains are not uncommon on the coastal Peruvian desert. The contrast between the deep azure of the Pacific—alive with birds, shellfish, and herds of basking sea lions—and the brilliant but lifeless desert was for me as aesthetically moving as it was biologically interesting.

Our first extensive look at the *altiplano* (the high Andean Plateau generally above 11,000 feet) came in the department of Moquegua above the small mountain city of Torata. Although it rained on us nearly every day, and fog was the rule rather than the exception, the altiplano is usually a cold and relatively dry environment. Basically there are two seasons—a cold, dry season, which lasts from March or April to about November; this is followed by a somewhat warmer, wet season, which ordinarily has its peak in January or February.

We visited the altiplano from March through May, often encountering daily fluctuations in temperature from 20° to 70° F., especially above 12,000 feet. We experienced sudden downpours that would drench us in moments if we were caught out on the traplines, and hailstorms that

*Puna vegetation at an altitude of some 13,000 feet. Needlegrass (*Stipa ichu*), a foot or two in height, predominates among other scrubby species known collectively as* tola. *Snowcapped Chachani, in the background, rises to an elevation of nearly 20,000 feet several miles northwest of El Misti.*

The Peruvian coastal desert—stark, barren, nearly lifeless. Because a decade or more of drought is not uncommon here, the only oases of life occur along occasional river valleys and foggy lomas.

dropped marble-size chunks of ice. One morning we were stunned to find five inches of snow covering all our traps; we were thus prevented from finding them until following the afternoon melt.

Winds could also be strong and gusty, and more than once they blew down a rain fly or shook the tents until we thought they might break. Because of the thin air, there is high insolation on sunny days, and we often stripped to the waist, or wore only a light shirt. But if a cloud mass moved in, the mercury sometimes plummeted 30 degrees in a matter of minutes, quickly sending us for our down vests and jackets.

Puna is a term used to describe the vegetation of the altiplano, which in many ways resembles that of the drier parts of the southwestern United States. The plants are often thorny, stiff, dry, and have reduced leaves with a waxy or hirsute epidermis to minimize water loss.

Our visits came in the spring—a time of reproduction and new growth for most plants and animals. The ancient terraced slopes appeared velvety green, deceptive of the cold, bitter, and dessicating winds that seasonally sweep this high plateau.

Ichu grass, a common plant of the puna, is stiff and needle-sharp, and grows in thick bunches. *Tola* is a term used to describe several species of short, scrubby plants not unlike those found in our native sagebrush communities out west. *Azorella,* sometimes called cushion plant, occurs in the highest elevations. A tiny member of the parsley family, *Azorella* differs from familiar parsleys by its colonies which grow in thick, compressed "mats" over rocks and boulders, giving the appearance of huge green coral heads.

Lichens and mosses also abundantly grow on rocks and in crevices at these high elevations. Several species of cactus and dry, treelike shrubs dot the lower (11,000-foot) elevations, and together with a great diversity of small, weedy forbs and short grasses comprise the remainder of the puna vegetation. The only tree native to the southern Peruvian puna is *Polylepis,* an unusual member of the rose family that grows to 15 or 20 feet. But this naturally rare species has nearly been eliminated by man, who uses it as firewood.

Moving from the western slopes to the central mountains, we noticed a striking change in the rodent fauna. Several species new to our traplines added excitement and renewed interest in examining the daily catch. The chocolate mouse, *Akodon jelskii,* was one of these. Its rich brown color and large white ear patches, pure white belly, reddish brown feet, and reddish brown nose, make it one of the most beautiful of small mammals.

We also trapped several other species of *Akodon* and *Phyllotis,* plus several other genera including *Calomys* and *Neotomys.* In one area we captured five species of *Phyllotis* and three of *Akodon,* all on a single trapline in a 24-hour period. Very few areas of the world offer an opportunity to study closely related mammals that partition their environment in such an ecologically packed situation, and this was ➤

one of the reasons I had chosen Peru for my studies.

Before we finished our work, we had trapped an adequate sample of more than 15 species of rodents in about 50 different localities from sea level to nearly 15,000 feet. The specimens and data, now safely stored in Field Museum, are currently undergoing a variety of detailed analyses.

We found the people of Peru generally warm and friendly and interested in our work. Our Peruvian colleague, Rolo, often pointed out interesting aspects of the archeology and cultural sights that abound in southern Peru. Part of our cultural experiences involved food, and Rolo proved to be a prolific source of culinary delights both at camp and in the altiplano cities.

Always exciting were our shopping trips into the *mercado,* or open market, where vendors bark everything from clothing and hardwares to blankets and leather goods. Countless varieties of fruits, grains, and vegetables as well as meats, fish, and fowl—many of which U.S. markets rarely see—made shopping in the noisy, bargaining atmosphere a memorable, if not joyous event. To transform the unusual foods into palatable fare often required imagination and dexterity by whomever was elected "cook for the day," since our kitchen ran on one-burner kerosene stoves. There were many memorable meals (and only a few that I'd rather forget!).

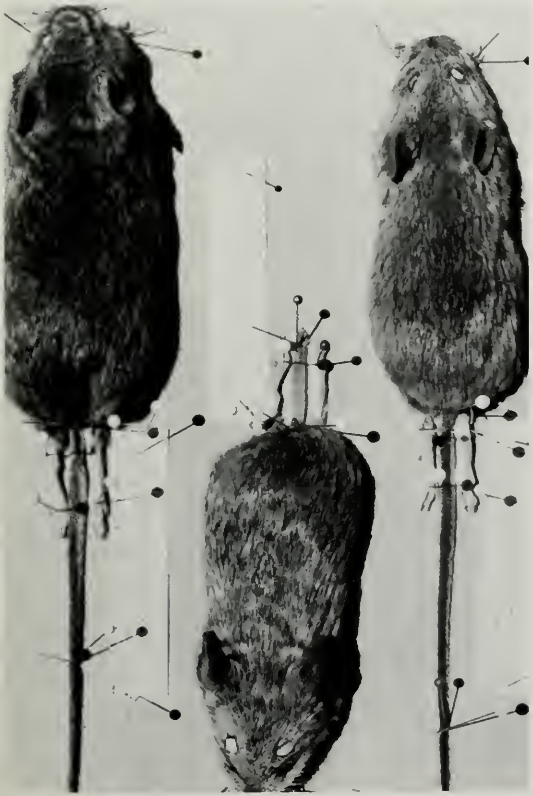
Many persons and organizations were involved in the expedition, each contributing in some special way to the accomplishment of our "mission." The experiences we shared will be with us for a long time to come . . . the long hours of planning and preparing as well as the delightful hours of driving into unseen vistas . . . the exhilaration of seeing our first condor soaring high, and the exhaustion of pushing a truck miles back to camp . . . the pleasure of meeting new friends, and the pain of separation from family . . . the joys of discovery, and the aggravation of car problems a hundred miles from a mechanic.

Murphy's Law ("Whatever can go wrong, will go wrong—and at the worst possible moment!") is always most apparent to me when I'm in the field. But in spite of this, our expedition seems to have succeeded beyond our expectations. The analyses of the plants and animals will keep us and our Peruvian colleagues busy for the next few years. But our efforts should result in a greater understanding of the evolutionary processes of mammals within the context of their ecology. ☐

Rolando "Rolo" Estrada, Peruvian member of the expedition team, places vials of tissue specimens in a tank of liquid nitrogen (—320° F). Protein analyses of these tissues for genealogical studies are currently being done in Field Museum laboratories.

A specimen is weighed and measured by field assistant Mike Mortimer. The data are used in identifiying species groups and in studying variability in populations.

Museum study skins are required for identification of the various species. A tag attached to each specimen carries data on external measurements, place and date of capture, name of the collector, and species name. These skins, stuffed with cotton, are stored in Field Museum's mammalian research collection. Such specimens are "biological documents" necessary for studies of variation. Their value goes far beyond the present project, as they are permanently available for future studies.



Field Briefs

Herpetology Auction

The Chicago Herpetological Society's annual auction will be held on Sunday, October 3, from noon until the last item is sold, at the Latvian Community Center, 4146 N. Elston Avenue (one block north of Irving Park Road), in Chicago. An admission fee of $1.00 will be charged persons who are not members of the society. Items to be auctioned include a variety of living reptiles and amphibians, as well as aquaria, cages, books on herpetology, and related equipment.

The society is a nonprofit scientific and educational organization which meets the last Wednesday of every month at the Chicago Academy of Sciences, in Chicago. More information about the society may be obtained by phoning Bonnie Samuelson at 222-0400, ext. 309, 9 a.m.—5 p.m.

John Terrell Leaves for South Pacific

John Terrell, Field Museum's curator of Pacific Islands archaeology and anthropology, left Chicago at the end of August for the Solomon Islands in the South Pacific. His journey will take him to Hawaii, Fiji, New Zealand, Australia, Papua New Guinea, and the islands of Choiseul and Bougainville in the Solomons archipelago.

"People often ask me where I will be digging next," says archaeologist Terrell, an authority on the prehistory and biogeography of Melanesia, the islands in the southwest Pacific inhabited by dark-skinned villagers who settled there thousands of years ago. "This trip is mostly for talk, not digging. I will be meeting with colleagues, students, officials and villagers to discuss my hopes for an international program to study the prehistory, anthropology, linguistics and biology of the people who live on the islands in the beautiful Bougainville Strait 600 miles east of Port Moresby, New Guinea." If Terrell's journey is successful, he will be seeking funds from private and government sources for an initial expedition to this little-known area of the Pacific in late 1977 or early 1978.

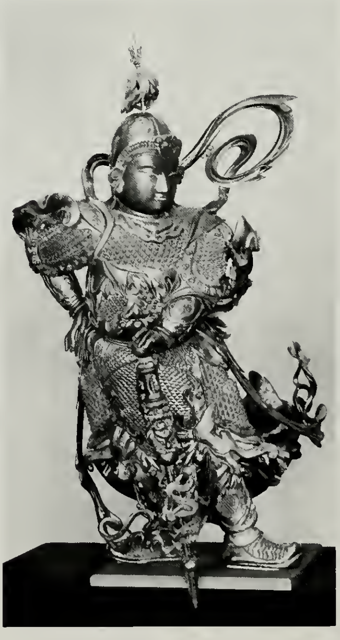
A Defender of the Faith and His Miracles

(The following article first appeared in the February, 1933, Field Museum News, *and was written by Berthold Laufer, then curator of the Department of Anthropology. The statue of Wei-to may still be seen in Hall 24.)*

An exhibit of carved wooden images of Buddhist and Taoist deities was recently installed in George T. and Frances Gaylord Smith Hall (Hall 24). Most of these were obtained from ancient temples in and around Si-an-fu. One of them is a statue of Wei-to, the loyal protector of Buddha's temples and a staunch defender of his faith.

This statue, well carved and finely lacquered, is glorified by a tradition. During the seventh century there lived at Si-an-fu a Buddhist priest, Tao Süan by name. Like all monks he was devoted to contemplation, looked upon as the means of attaining self-perfection. Meditation naturally led to dreams, in which he had contact with the supernatural. Tao Süan wrote his memoirs, in which he records his conversations with the gods. Among others Wei-to appeared and ordered his statue made exactly like his apparition. Tao Süan obeyed, and thenceforward images of Wei-to were set up as the guardians of Buddha's temples and clergy.

Wei-to, "defender of the faith"



All other Buddhistic divinities are derived from types created in India, where Buddhism was born. Wei-to is the only one conceived in China. He has the appearance of a handsome Chinese youth with a smiling countenance, yet is a powerful general fortified by a suit of mail, ever ready to strike demons and foes of the faith.

The temple from which came the Wei-to now in the Museum was erected on the spot where Tao Süan lived and taught. According to tradition this statue was a descendant of Tao Süan's work, permeated by his spirit. It was regarded, therefore, as a great miracle-worker. Wei-to, above all, was a good provider, an efficient money-raiser, and bill collector. In some monasteries the monks placed his statue in the kitchen, entrusting its supervision to his care. Sometimes they even recited incantations, threatening him with corporal punishment if he should neglect to supply them with provisions.

Whenever a temple was in need of repairs, or a pagoda was to be restored, Wei-to was instrumental in raising the necessary cash. The brotherhood would stage a procession through the city. One monk, carrying a shrine harboring Wei-to's picture, and beating a wooden drum in the shape of a fish, solicited funds from the wealthy. If this was unsuccessful, a monk would deposit Wei-to's image on the threshold of the house of a prominent family, obstruct the entrance, and remain seated there cross-legged like a Buddha, for days if necessary, until the contribution was made.

If the monks again failed in this quest of charity, they resorted to extreme measures. One would be locked in a cage just high enough to allow him to squeeze in, and would then be exhibited in the market place. The door of the cage was padlocked, and the news was broadcast that he was doomed to die of starvation unless the money was raised. The people were urged to have pity. To arouse their feelings, it was said that the prisoner's bare feet rested on iron spikes. This in a way was true, but the spikes were so deeply sunk into a plank that it formed a smooth surface. Moreover, the man was always secretly released before harm could befall him.

It will thus be seen that "rackets" are not of recent origin, but that they have a history whose threads may take us back to the intricate mysteries of the Orient.

The Great Pyramids near Giza.

Courtesy of the Oriental Institute

Members' Tours to Egypt

Karnak, Luxor, Abu Simbel! These are some of the legendary sites in Egypt that will be visited by Museum members this winter. Seven separate, but similar, tours, with Chicago departures December through March, will visit major sites of the ancient Egyptian kingdoms as well as many of the Islamic, early Christian, and Classical monuments.

Each of the 18-day, 17-night tours, limited to twenty persons each, will be accompanied by an Egyptologist from the Oriental Institute. In addition to the numerous historic sites, superb museum collections in Egypt will be visited, and special arrangements have been made to acquaint members first-hand with the activities of the Epigraphic Survey at Chicago House, Luxor. There will also be an excursion by boat between Aswan and Luxor. Four of the tours, all identical, will travel *downstream* on the Nile; three tours, all identical, will travel *upstream.* Tour dates are (#1) Dec. 29-Jan. 15; (#2A and #2B) Jan. 8-25; (#3) Jan. 15-Feb. 1; (#4) Jan. 29-Feb. 15; (#5) February—dates to be announced; (#6) March 12-29; (#7) March—dates to be announced.

Total cost of each tour, per person, is $2,385.00, which includes a tax-deductible contribution of $500.00 to Field Museum. The tour price also includes air fare and all other transportation and transfers, hotels (double occupancy), meals, and gratuities. Itineraries, registration forms, and other information may be obtained by writing or calling Dorothy Roder, membership secretary, Field Museum (922-9410, ext. 206). If writing for an itinerary, please specify preferred tour number.

Abu Simbel. Facade of the temple of Hathor viewed from east bank of the Nile.

Courtesy of the Oriental Institute

SAHARA

The Growing Giant

The relentless advance of earth's largest desert is a complex and disturbing phenomenon

By Burt A. and Susan Ovrut

Photos by the authors

This oasis in southern Morocco illustrates the fertility that water can bring to the desert. The women harvest wheat, fruit, and dates for their own consumption and for export. At this oasis the water is available at the surface, but usually it is buried deep under the sand and extensive labor is needed in building wells and underground reservoirs.

> *A boundless horizon was already expanding before us, and we could distinguish nothing but an immense plain of shining sand, and over it a burning sky. At this sight the camels uttered long moans, the slaves became sullen and silent . . . .*

This was the impression left by a young French explorer, René Caillie, of his first sight of the Sahara Desert in 1828. He was travelling from Timbuctu northwards to Morocco, and the above description was written as the last remaining shrubs and pasturage of the Sudan* died away at El Araouane, leaving only the Great Desert before him.

Time has done nothing to alleviate the awesome heat and barrenness of the Sahara. In fact, drought and persistent over-grazing of the Sudan by livestock have extended the desert. In the 150 years since René Caillie's journey, the desert has expanded 100 miles south of El Araouane.

Despite its present climate, there are many indications that the Sahara was once much wetter and greener than it is today. Prehistoric rock paintings lying in isolated regions of the desert are testimony to the abundant life once surrounding their painters. The drawings depict animal life now seen only hundreds of miles away in a green savannah environment. These sites are usually found near the dry beds of ancient rivers which were once powerful enough to cut extensive channels and polish smooth the surrounding stones. Now, only a few shrubs remain, growing by means of extensive root systems feeding on the water still present, but deep under the sand.

Why the Sahara was once so much wetter, and what factors led to its remarkable desiccation are puzzles with complex solutions, rooted in geography, climate, and in man himself.

The Sahara Desert is a depression surrounded by highlands. To the north lie the Atlas Mountains of Morocco and Algeria, snowcapped peaks with a maximum elevation of almost 14,000 feet. To the south lie the Fouta Djalon Plateau of Guinea, the Adamaoua Massif of the Cameroons, the Ruwenzori of Uganda, and the highlands of Ethiopia. These southern ranges are all well watered by the tropical storms of equatorial Africa and enormous quantities

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*The word *Sudan* is used here in its traditional sense to designate the territory bounded in the north by the Sahara, in the south by the equatorial forests, in the west by the Atlantic, and in the east by the Red Sea. The word derives from the Arabic *suda* meaning "blacks" and thus refers to the land of the blacks. This use of the term should not be confused with the name of the nation in eastern Africa.

Burt Ovrut is a graduate student at the University of Chicago. He and his wife, Susan, have made extensive trips into the Sahara and neighboring regions of Africa.

A member of the Toureg tribe — the "Blue Men" of the desert — leads his camels outside Tamanrasset, Algeria. The introduction of the camel into Africa in the declining years of the Roman Empire was a turning point in the history of the Sahara. Along with improved irrigation methods, it enabled a gradual human repenetration of the desert to begin.

of water drain northward towards the Sahara.

In the Fouta Djalon these waters coalesce to form the Niger River, which works its way northward through ever increasing aridity to Timbuctu. Here, as though sensing the nearness of the desert, the river turns east, passes through the Tosaye Gorge and bends abruptly to the south. The Niger now flows away from the desert and enters the Gulf of Guinea in Nigeria. Thus, none of the water from the Fouta Djalon enters the desert. However, there is a great deal of geological evidence to show that in the distant past the Niger River did not turn abruptly at Timbuctu, but actually continued flowing north for several hundred miles and terminated in a great inland lake. Upon drying up, this lake left behind large salt deposits. These have been mined by Arabs and Sudanese for a millenium, first at Terhazza and in more recent times at Taoudenni. To this day camel caravans transport salt from Taoudenni to the saltless Sudan via Timbuctu. It was along this ancient track that Réné Caillie travelled on his way to Morocco.

Northward from the Adamaoua Massif and the highlands of the Central African Republic flow the Logone and Chari Rivers. These rivers unite at Fort Lami, Chad, and travel together perhaps 100 miles into the desert before terminating in yet another inland lake—Lake Chad. Though still very large, Lake Chad is showing signs of desiccation. It certainly has diminished in size since its "discovery" by European explorers in 1823. A modern tourist visiting Waza National Park in the Northern Cameroons will be enjoying its abundant wildlife on the dry bed of a once larger Lake Chad.

From the Ruwenzori and the Uganda highlands flows that most famous of all rivers—the White Nile. Moving northward through Equatorial Province of the Sudan, the river encounters increasingly arid conditions and, like the Niger and Chari Rivers, the Nile begins to change. The river becomes confused and runs in many channels through dense swamp. This is the Sudd, whose marshes stopped all exploration of the Nile until Samuel Baker forced his way through it in 1863. It is here at the Sudd that the river tries to terminate in another inland lake. However, unlike the ancient Niger and the modern Chari, it fails to do so and continues flowing until reinforced by the Blue Nile from Ethiopia at Khartoum. From here the united Nile succeeds in forcing its way across the Sahara Desert through Egypt to the Mediterranean Sea. The Nile River is at present the only source of surface water to traverse the great Sahara Desert.

The elevation of the Atlas Mountains and their proximity to the desert would tend to make them a powerful watershed ➤

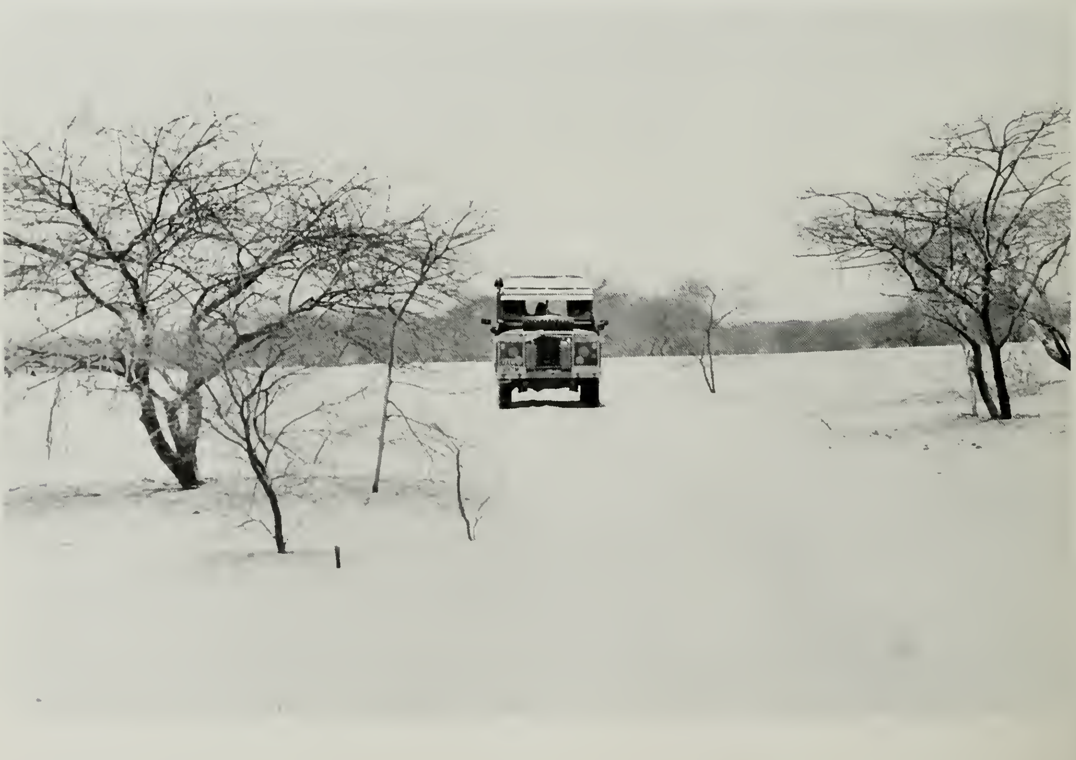
for the Sahara, and they undoubtedly were so in the past. However, their present role deters rather than aids the flow of water into the desert.

Anyone driving eastward from Portland or Seattle in our American Northwest will notice the abrupt change from semi-rain forest to hot, sagebrush desert as he passes through the Cascade Range. Pacific air, blocked by the high peaks, is forced to precipitate most of its moisture on the western side of the range, leaving eastern Oregon and Washington states semiarid deserts. Thus, the Cascade Mountains are said to create a "rain shadow" where very little rain will fall. In exactly the same manner, moisture-laden Atlantic and Mediterranean air coming from the north is blocked by the Atlas Mountains, creating a rain shadow southward and helping to form the Sahara Desert. Now, of course, not all precipitation occurs on the northern side of the Atlas. A certain amount does manage to land south of the divide, to coalesce into streams and to flow towards the desert. However, the volume of these streams is usually too small and the heat of the desert too great for them to survive for long. Within 30 to 40 miles from their source all that remains of these mountain torrents are a few surface puddles, most of the water having percolated into the gravel bed.

It happens from time to time that a particularly severe storm strikes the Atlas or perhaps that the winter has deposited large quantities of snow on the peaks, which then melts suddenly in the spring. At times like these, the mild Saharan streams take on a new life and thunder out of the mountains, often with fatal fury pushing far into the desert before finally succumbing. The former French colonial administration in Algeria at the turn of this century recorded flood waters in the Saoura Wadi reaching as far as Touat, more than 400 miles from the Atlas Mountains and deep in the desert. The fury and suddenness of these floods was such that the French Foreign Legion absolutely forbade its troops to camp in a seemingly dry wadi bed for fear of having them swept suddenly away as they slept. Today the power of these floods is mitigated by dams, but an unwary traveller may find bridges washed out and roads under water.

It is these intermittent torrents that give the greatest insight into the nature of the prehistorical Sahara. During the Ice Ages, when glaciers and snow claimed most of Europe, the temperate zone with its relatively heavy rainfall was pushed far to the south. The occasionally severe storms that occur now were then commonplace and the Atlas streams flowed perennially far into the desert. Over the millenia large river valleys were cut into the desert rock. The magnificent but now dry valleys of the Draa, the Saoura, and a hundred others

The sand of the Sahara is moving south into the forested areas of the Sudan. This Land Rover is on a main road in southern Niger. A once-green forest is now choked with sand, and only skeletonlike acacia trees remain.



This tomb of a Moslem holy man was built between an oasis and a sand dune in Taghit, Algeria. The Sahara has always been the home of man, but it has never been densely populated. Oases are small, and few in number, and their total area is insignificant in comparison with the arid surface of the Sahara.

were created at that time. It is along these ancient valleys that today's floods course into the desert.

There are two mountainous highlands deep within the Sahara that are now as waterless and lifeless as any place on earth. They are the Hoggar Mountains in Algeria and the Tibesti Mountains of Chad. Volcanic in origin, the shattered basalt columns and lava flows give an impression of the surface of the moon, barren and lifeless. A few thousand seminomadic Toureg and Tibbu tribesmen eke a living out of this bleak environment. The recent drought has driven many Toureg into the only town in the area, the old French administrative capital of Tamenrasset. Yet, here in these mountains where summer temperatures are over 120° F. it may occasionally rain and in the winter even snow. The French records for Tamenrasset show the following item for January 1922.

> *On January 15th, at 8 p.m., a hurricane broke over the region, followed by a torrential rain. The roofs of the houses almost all fell in . . . . Rain continued to fall on the 16th and the wadi overflowed . . . . The rain fell less heavily on the 17th, the wadi subsided and the weather cleared. There was seen to be snow on the neighboring summits.*

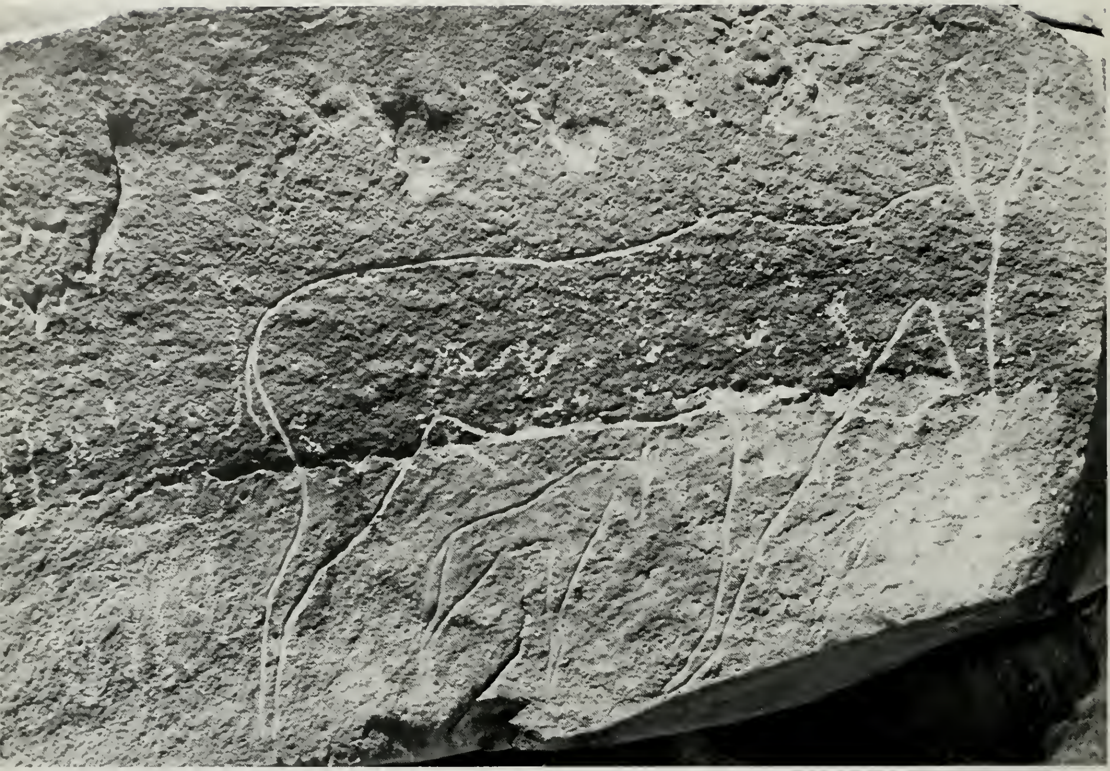
The Ice Ages here, as in the Atlas Mountains, would have turned these now rare deluges into common occurrences and major rivers would have issued forth from the well watered heights. A myriad of dry river valleys that flow radially in all directions from the Hoggar and Tibesti prove that this was indeed the case.

Thus, a picture of the Sahara during the last Ice Age emerges. Though the region was semiarid and hot, relief was to be found in a Niger River that terminated deep in the Sahara and a greatly expanded Lake Chad. From the well watered highlands of the Atlas, Hoggar, and Tibesti flowed hundreds of rivers, some of them like the Saoura of major extent. It was an environment ideally suited for elephants, lions, ostriches, giraffes, and all the other denizens of the present African plains. And where there is water and food, there follows that most interesting denizen of all—man.

First as hunters and later as nomadic herdsmen, these people roamed the Saharan steppes. As the European glaciers receded and the Sahara became dryer, they found themselves more and more confined to the vicinity of the larger wadis. To be near the ever-diminishing water supply, encampments were made on the banks of these rivers. Here, the usual human debris of flint chips, broken pottery, and bones was deposited and forgotten. Occasionally—perhaps in a mood of exuberance or as a religious ceremony—someone saw fit to leave behind less mundane evidence of human habitation. On smooth rock walls of the river valleys people painted and carved scenes of their contemporary life. All the animals of the hunt—giraffes, gazelles, ostriches, and many other species were recorded. So were lions, hyenas, and other animals that made life so insecure. Later the herds of long-horned oxen were immortalized on the stone. Human figures were recorded too, usually in the act of hunting though sometimes a more abstract, perhaps magical role was given them.

However, the drying up of the Sahara had begun. The European ice cover was receding. Storms in the Atlas became less frequent and storms in the Hoggar and Tibesti became rare. Perennial streams dwindled until dwarfed by their valleys, became intermittent, and then died altogether. The Niger River, however, with its headwaters in the tropics was not affected much by the end of the Ice Age. Its fate was different. Two nearby river systems are occasionally separated by terrain of such low elevation that, during a heavy flood, water from one system may actually cross to the other. If this happens often enough, a permanent channel may be cut, and the water from the weaker of the two rivers diverted to the stronger. The two rivers become one, the original connecting channel being recognizable as a sharp bend in the new river. The stronger river is said to have captured the weaker one and the sharp bend of the old connecting channel is called an "elbow of capture."

That the Niger was captured by a vigorous Saharan river with its headwater in the vicinity of the Hoggar and its terminus in the Gulf of Guinea there can be no doubt, though exactly when this occurred is uncertain. The great bend of the Niger between Timbuctu, Tosaye, and Gao is a textbook example of an "elbow of capture." This diversion of Niger water from ➤



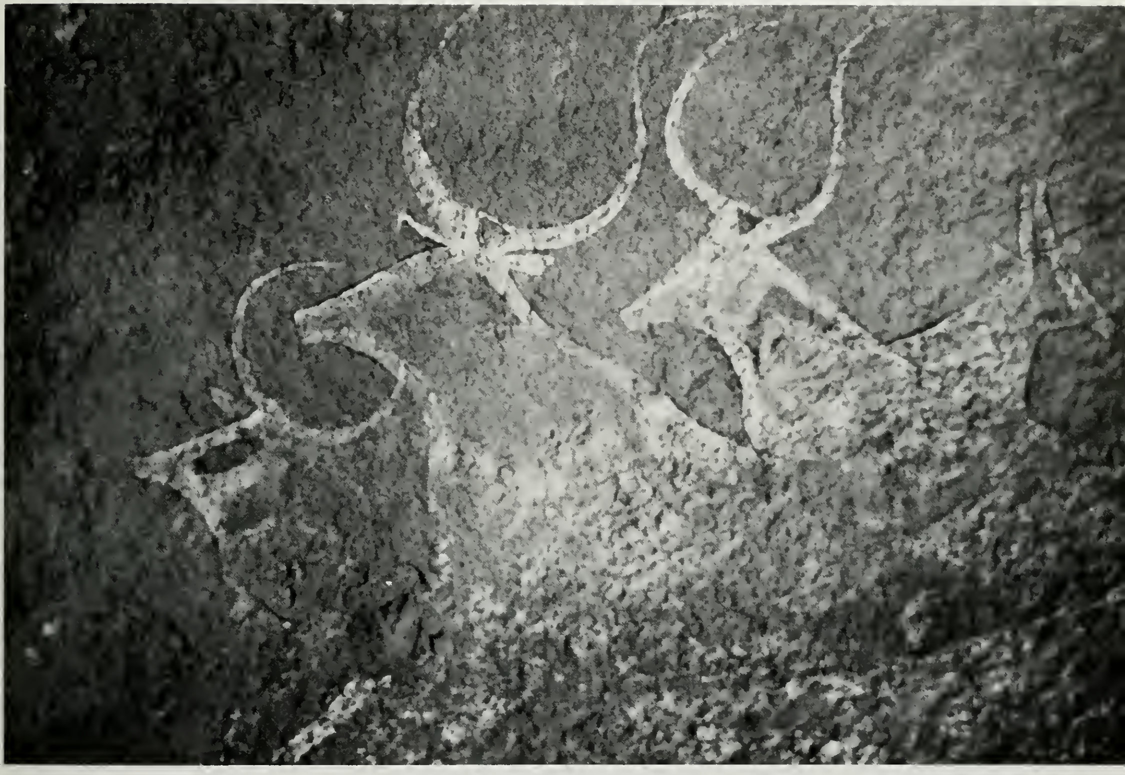
The scenes of animals on this and the facing page are in a barren and inhospitable area deep in the Sahara Desert. They are testimony to a time when the region supported an abundance of plant and animal life.

the desert cut off the old terminus lake and it eventually dried up, leaving the large salt deposits that later played an important role in the economy of the desert. The cause of the progressive shrinking of Lake Chad is less clear, although river capture seems to play a part in it. Temporary capture of the Logone by the Benue River during flood season has been observed but no permanent channel as yet exists. There is some evidence that previous captures of tributary streams of the Logone by tributaries of the Benue have occurred, thus weakening the Logone and Lake Chad in favor of the Benue system and the Atlantic Ocean. The Nile has remained relatively unchanged since the last Ice Age.

When the water supply finally disappeared, human habitation became untenable. Larger and larger regions of the Sahara were taken over by the advancing sand. Human and animal life fled both northward to the Mediterranean coast and southward toward the Sudan. Many of the animals today associated only with equatorial Africa found themselves north of the expanding desert, cut off from the larger southern herds. These isolated ''residual fauna'' managed to exist in North Africa until the colonial hunters of the last century drove them to extinction. Thus, when Hannibal's army crossed the Alps into Italy in 217 B.C. it was on the backs of North African elephants. Later, Roman soldiers hunted lions for sport and ostriches for profit in their African provinces.

The introduction of the camel into Africa during the declining years of the Roman Empire, coupled with improved tools for well-digging and irrigation, allowed a gradual human repenetration of the desert to begin. The reoccupation of the southern lee of the Atlas Mountains took perhaps half a millenium. The beautiful Moroccan oases of Draa and Tafilit along with those of the Wadi R'ir district in Algeria were probably established during that period. The Arab conquest of North Africa in the 7th century A.D. and the subsequent political unrest seems to have accelerated this process. The oases of the Saoura Wadi in lower Touat, deep in the Algerian desert, were established by the end of the 10th century. Even so, many of the more remote oases such as In Salah on the fiercely hot and barren plateau of Tidehelt did not exist until after the 13th century. Many of these oases were poorly watered, and it was only after the French colonial administration greatly improved the water supply by sinking new wells that they blossomed into the lush gardens that they are today.

The gradual human reoccupation of small, favored portions of the desert has a heroic quality about it, which brings sharply into focus man's role in the desiccation of the Sahara. At the beginning of this century French archaeologists working in the hot, dusty savannah of Algeria and Tunisia found a curious artifact—the olive press—scattered everywhere at old Roman



sites. These finds pointed undeniably to the conclusion that the olive must have been grown in North Africa during the Roman period. The enormous number of presses found indicated that the olive tree was widely grown and in great abundance. This discovery came as quite a shock, since in North Africa at the time shade of any kind was hard to find and olive trees nonexistent. The fact that since the Roman period the olive had fallen out of cultivation in North Africa was ascribed to a supposed increase in the aridity of the Sahara and its fringe regions over the past two millenia.

This theory was shattered, however, when at the prompting of some of the more enlightened scholars of the day, the government launched trial projects and succeeded in growing olive trees with no difficulty at all. If the olive could still be grown, it could not then have been drought nor aridity that had brought the desert to the very shores of the Mediterranean. The answer could only lie with man. The Carthaginians and later the Romans found the Mediterranean Coast probably not unlike it was found by the French a century ago, semiarid and minimally cultivated. The Romans built public works systems of dams and cisterns to collect water, and aqueducts to transport the water to where it was most needed. Some of the ruins of these constructions still exist. Such extensive irrigation greatly expanded the amount of arable land, allowing wheat and olive trees to grow where nothing had been cultivated before.

For almost a millenium, through all the vicissitudes of history, these irrigation systems were kept in repair and the fields and orchards tended. Then, in the 11th century, the labor of countless generations was destroyed, totally and irrevocably when the Banu Hilal Arabs swept across North Africa. Likened by Ibn Khaldun, the Arab historian, to a plague of locusts, the Banu Hilal plundered, murdered, and destroyed wherever they went. The irrigation systems collapsed, fields were abandoned, and the olive trees cut for firewood. Civilization succumbed to the sword and the relentless desert moved in to reclaim what it had lost so long before to the Romans. The Mediterranean coast remained barren until this century.

The causes of desiccation may be much more intricate and subtle than economic or military catastrophe. Recent studies in West Africa have led to the rather startling conclusion that humanitarian programs to eliminate sleeping sickness by destroying the tsetse fly may be contributing to the spread of the Sahara. Sleeping sickness is even more of a scourge to cattle than it is to man. Its eradication means improved health in cattle and therefore greater bovine population. This has led to overgrazing in the Sudan during a period of drought and the subsequent advance of the desert sand. A more speculative, but very possible cause of desiccation in southern Algeria and Libya, is the ►

▲
The Saoura wadi in Algeria was once a powerful river flowing through the Sahara. Now dry, its bed can be clearly distinguished. Periodically, a severe storm at the river's sources in the Atlas Mountains will flood the Saoura. If a traveller were caught in the wadi during such a storm, he could suffer the ironic fate of death by drowning in the Sahara.

◄ *This ksar, a fortified town, is in Morocco, in the Draa valley. The walls are built simply of clay or hardened mud, but it is a complex structure, containing markets, houses, shops, and cafes. Oasis-dwellers needed the protection of fortified walls against attack by nomadic tribes.*

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vast quantity of oil being taken from the desert in these regions. It is conjectured that ground water may be filling the vast underground areas vacated by the oil and thus drastically lowering the water table.

It is clear, then, that there is more to the spread of the Sahara Desert than the large scale climatic and geographical changes outlined above. Man, too, plays his role, He can irrigate, plant, and reclaim areas of the desert for himself. Or, he can destroy, let his animals overgraze, and allow the desert to expand. It has become fashionable in the last ten years to attribute the rapid expansion of the Sahara southward into the Sudan solely to climatic changes and increasing aridity. If we are to learn anything at all from the strange story of the olive in North Africa, it must be that supposedly obvious explanations of desert expansion may be totally wrong. There is more to the relentless march of the Sahara Desert into the Sudan than a few years with no rain. □

OCTOBER at Field Museum

NEW EXHIBIT

Male and Female: Anthropology Game. This exhibit lets you look, as an anthropologist would, at 38 artifacts from the museum's great collections. Each object in the game is (or once was) used by men, by women, or by both sexes. You, the visitor, must guess which sex uses (or used) each. It's a fascinating way to discover that economic and social roles of the sexes are not universally the same. South Lounge, second floor.

NEW PROGRAMS

Edward E. Ayer Film/Lecture Series. To mark the opening of the west entrance and the reopening of Simpson Theatre,the museum is offering a film/lecture series of superior quality. Join us each Saturday, October 2 through November 27, at 2:30 p.m. in Simpson Theatre.

Oct. 2: Curtis Nagel: Our *Enchanted Islands of Hawaii*
9: Edward M. Brigham: *Wilderness '76*
16: Andre de la Varre, Jr.: *Grand Rhine Alpine Journey*
23: Dennis Glen Cooper: *Isle Royale*
30: Dick Reddy: *Mark Twain in Italy*
Nov. 6: Kenneth Armstrong: *Australia—Great Land Down Under*
13: John Goddard: *Exploring African Wonderlands*
20: Ted Walker: *The Sea and Shore of Baja*
27: Quentin Keynes: *Search for the Twisting Makonde*

The Ancient Art of Weaving. Members of the North Shore Weavers' Guild demonstrate weaving on a variety of looms including a two-harness, handcrafted Mexican floor loom and demonstrate spinning using a drop spindle. Demonstrations are from 10:00 a.m. to 12:00 p.m. every Monday, Wednesday, and Friday in the South Lounge, second floor.

SPECIAL PROGRAM

Man in His Environment Film Series. Now in its third and final cycle. The best and the newest environmental films are offered in conjunction with the museum's major new exhibit: *Man in His Environment.* Many of the films have never been shown at the Field Museum before. Films are shown at 11:00 a.m. and 1:00 p.m. in the Meeting Room, second floor north. All programs run approximately 1 hour.

The October theme is "Ecosystems: Natural Communities in Various Areas of the World."

Oct. 1, 2, 3: *Mzima: Portrait of a Spring*
Oct. 8, 9, 10: *Kodiak Island; Birds' Paradise: The Waddensea*
Oct. 15, 16, 17: *The Great Barrier Reef*
Oct. 22, 23, 24: *Galapagos: Islands for Evolutionary Discovery; Billion Dollar Marsh*
Oct. 29, 30, 31: *Baobab: Portrait of a Tree*

SPECIAL EXHIBITS

Man in His Environment. This exhibit takes a global view of some of the most serious environmental problems now confronting all mankind and asks visitors to involve themselves in these problems—and the need for solution. A salt marsh—recreating one at Sapelo Island, Georgia—offers a unique opportunity to study basic ecological principles within a total marsh environment. Hall 18.

Pliny's Natural History: The First Encyclopedia. Pliny, the Roman, (AD 23-79), compiled what has been called the first encyclopedia—viewed today as an astonishing mixture of fact and fiction. Two rare editions (1513 and 1530) of this work, now among many other rare works belonging to the Field Museum Library, are currently on exhibit in the South Lounge, second floor.

Pterosaur. An aluminum and fabric stylized model of the largest known flying creature—an extinct pterosaur—spreads its wings across Stanley Field Hall to dramatize a special exhibit of pterosaur fossils in the Northwest Arcade, second floor.

(CALENDAR continued on back cover)

OCTOBER at Field Museum

(CALENDAR continued from inside back cover)

CONTINUING PROGRAMS

Saturday Discovery Programs. Tours, demonstrations, and participatory activities are offered every Saturday from 11 a.m. to 3 p.m. Topics vary but often include:

Dinosaurs—Visit the Hall of Dinosaurs and make a clay dinosaur to take home.

Ancient Egypt—A half-hour tour through the Egyptian collection, including an explanation of the hows and whys of mummy-making.

Snakes—Live Snakes are featured in the Hall of Reptiles and Amphibians.

Traditions in Chinese Art. A half-hour tour traces the origins and development of Chinese art styles.

For specific programs and times, phone the museum or inquire on arrival at museum entrances.

Autumn Journey for Children: My Kind of Town. A free, self-guided tour about the animals, geology, and early history of the Chicago area. All children who can read and write are invited to participate; families will enjoy it too. Journey sheets are available at the information booth. Bring pen or pencil.

SPECIAL-INTEREST MEETINGS OPEN TO THE PUBLIC

Oct. 1, 8:00 p.m.	**Chicago Anthropological Society**
Oct. 5, 7:30 p.m.	**Kennicott Club**
Oct. 12, 7:30 p.m.	**Chicago Nature Camera Club**
8:00 p.m.	**Chicagoland Glider Council**
Oct. 13, 7:00 p.m.	**Chicago Ornithological Society**
7:30 p.m.	**Windy City Grotto, National Speleological Society**
Oct. 14, 8:00 p.m.	**Chicago Mountaineering Club**
Oct. 19, 7:30 p.m.	**Chicago Audubon Society**

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The Museum Library is open 9:00 a.m. to 4:00 p.m. Monday through Friday. Please obtain pass at reception desk, first floor north.

Museum Telephone: 922-9410

November
1976

Field Museum of Natural History Bulletin

Cash, Cannon, and Cowrie Shells: The Nonmodern Moneys of the World

Field Museum of Natural History Bulletin

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CONTENTS

Cash, Cannon, and Cowrie Shells: The Nonmodern Moneys of the World

By Bennet Bronson, assistant curator of Asiatic archaeology and ethnology

COVER

Brass cannon used in Borneo during nineteenth century as medium of exchange; 38 cm long. Cat. No. 162448. Photo by Ron Testa. For more on nonmodern moneys of the world see p. 3.

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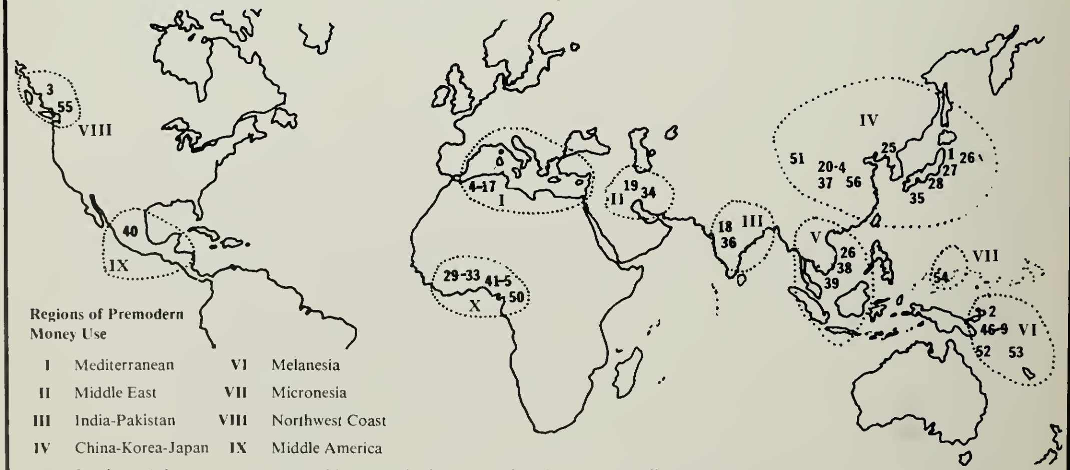
Nonmodern Moneys of the World



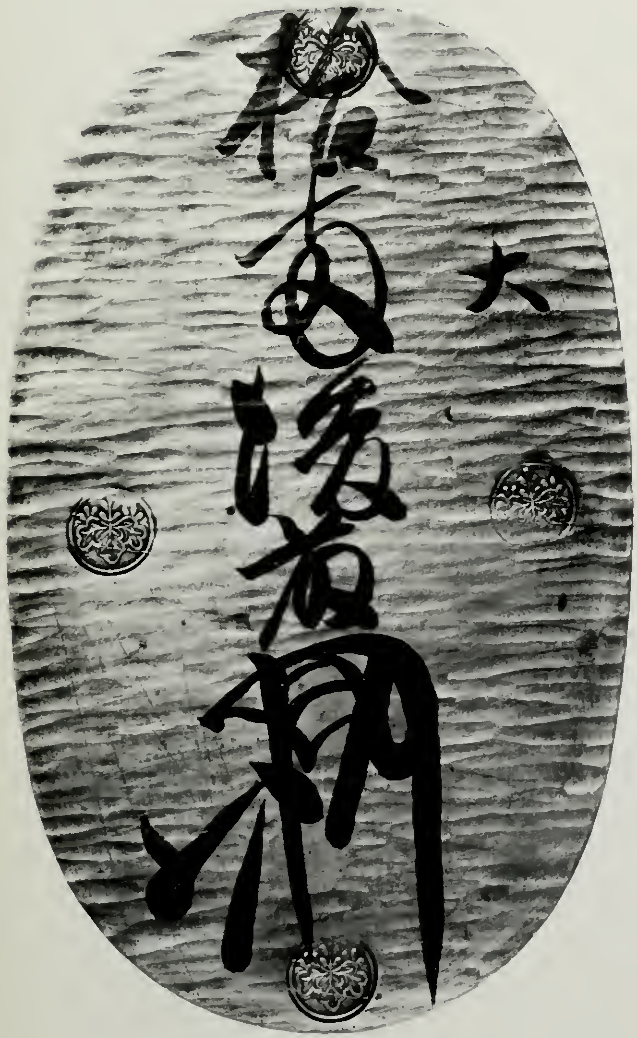
Regions of Premodern Money Use

I	Mediterranean	VI	Melanesia
II	Middle East	VII	Micronesia
III	India-Pakistan	VIII	Northwest Coast
IV	China-Korea-Japan	IX	Middle America
V	Southeast Asia	X	West Africa

Arabic numerals refer to figures illustrating text, pages 3-15

Cash, Cannon, and Cowrie Shells: The Nonmodern Moneys of the World

By Bennet Bronson



1. *Facsimile of gold* oban, *Japanese coin of Tensho period (A.D. 1588). Length: 156 mm. #27079 (B)*

The Other Moneys

This issue of the *Field Museum of Natural History Bulletin* is intended both as an introduction to and as a catalog for a special exhibit that will be on display at public Chicago-area locations. The exhibit focuses on a subject of special interest to banks as well as to their customers: money. The money involved, however, is of a kind quite different from that familiar to most of us.

The following pages illustrate and discuss no fewer than eighty varieties of money used by some fifty societies of the past and present. Although they differ widely in value, materials, and mode of use, these moneys have two things in common: each was, in its time and place of origin, real money with most of the essential functions we associate with that term, and each was invented independent of our modern Western economic tradition.

Bennet Bronson is assistant curator, Asiatic archaeology and ethnology.

Every type of currency used today traces its beginnings to the monetary system evolved in Western Europe between the 14th and 15th centuries. Even the remotest and most socialist nations now produce minted coins and paper bills, have banks with savings and checking account services, and in general make full use of a system much like our own. But it is important to realize that many other systems once existed, in Europe as well as the rest of the world. It is those systems, used by most of the world's societies during most of recorded history, which concern us here.

What Money Is

Much of the money illustrated in these pages is made of shell, of teeth, of fiber, or of stone; but much of it is also fashioned from metals such as iron, copper, silver, and gold. We feel instinctively that the metallic kind is more like real money than the first. But let us stop and consider. . . .

What makes money valuable? It is valuable simply because a group of people somewhere have agreed that it is so. Pacific islanders were once astonished to learn that there were places where good pigs could be bought with printed slips of paper. And how do some valuable items become money? Because those particular items have an accepted relative value or rate through which they can be converted into other things, and an accepted mode of conversion—a procedure through which they can be used to pay for goods and services. In the language of economists, a precious commodity is not money unless it is (1) a standard of value and (2) a means of payment and medium of exchange.

Such, at any rate, is the definition we have used here. We have therefore omitted from the exhibit some varieties of moneylike objects—for instance, gems from our own society, the famous "coppers" of the Northwest Coast Indians, and the *kula* ornaments of the southwestern Pacific—because (though often fabulously valuable and indeed standards by which the worth of all else could be measured) these objects were not used as regular exchange media. We have not been excessively persnickety about definitions, however. If an object was used more or less like money, if it is intrinsically interesting, and if a good example exists in the Museum's collections, it has been included in the exhibit.

How Money Began

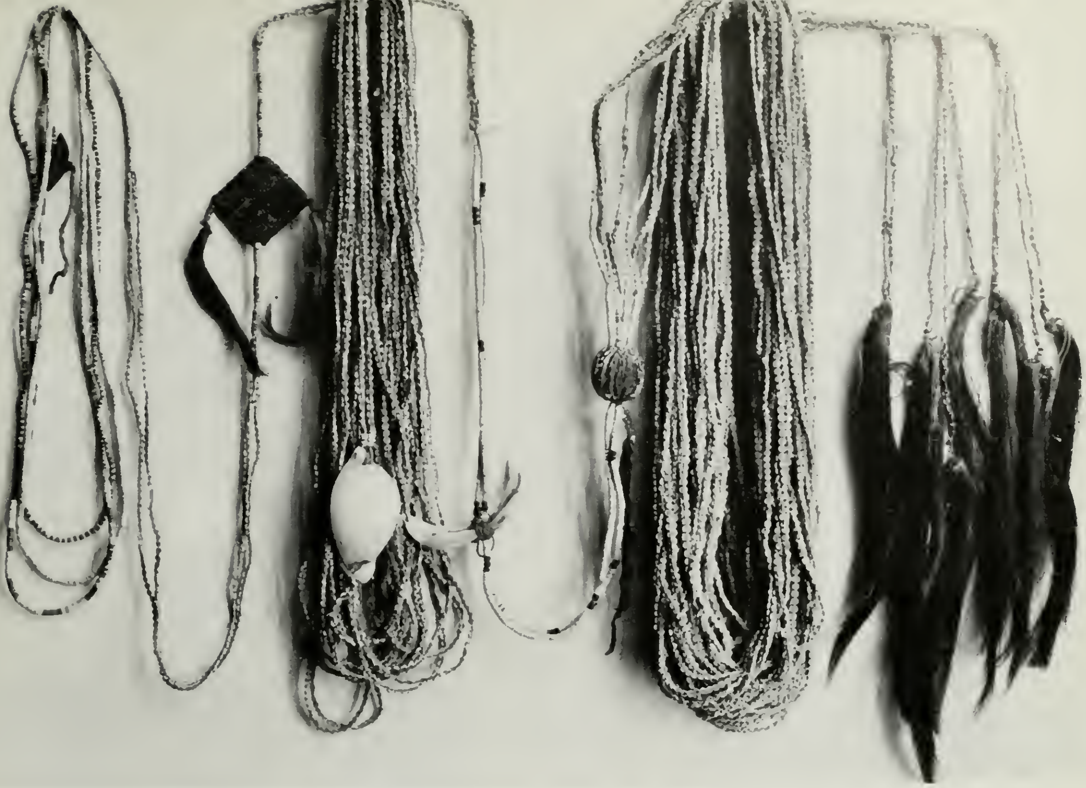
The problem of monetary origins has been badly confused by arguments over definitions and by nationalistic claims, since some people believe that money is synonymous with civilization and therefore wish to claim their ancestors invented it. On balance, our opinion is that the concept of money arose independently several times in different parts of the world. Indeed, the idea seems so useful and natural that the proper question may not be "*Where* was it invented?" but rather, "*Why* was it not invented *everywhere*?" For, as the map on page 2 shows, there are several vast areas where money seems to have been unknown prior to the introduction of modern currencies. Nothing like money existed anywhere in the central and eastern Pacific, or Australia, or southern Africa. Astonishingly, in view of the complexity of the ancient societies and economies there, it is not known to have existed in pre-Columbian South America.

The only possible conclusion from these facts is that money is a natural development but not an inevitable one. It gives flexibility to an economy and makes accounting and judging efficiency easier; many peoples must have developed it spontaneously. Yet, we should not allow ourselves to believe that using money is the only route to economic rationalization or to large-scale organization of labor and exchange. The traditional societies of the western Pacific—Hawaii, Samoa, New Zealand—built complex and successful societies without money. And the ancient empires of western South America—the Incas and their predecessors—developed elaborate bureaucratic states whose populations numbered in the millions, without anything resembling money.

The Difference between Coinage and Money

It is not hard to confuse the question of the origin of money with that of the origin of coinage. The answer to the first is shrouded in the mists of time and controversy; the answer to the second is well understood, although it is perhaps not as crucial a question as historians once thought.

True metallic coinage appears between 700 and 500 B.C. in at least three separate places: China, India, and Asia Minor—the Asian portion of modern Turkey. All three areas had already used money in the form of uncoined ingots and seashells for at least several hundred years; what was new was the idea of having some authority, perhaps a government or some respected firm, stamp those ingots with a mark authenticating their weight and purity. Any such ingot, particularly if small and composed of precious metal, is considered a coin.



2. *New Ireland pig money, or* birok; *19th c. #136991 (B)*

Although the idea of the coin spread rapidly after its invention, it rarely triumphed completely over other forms of money. With the possible exception of the Chinese and Romans during certain periods, all ancient peoples (and indeed most peoples down to the end of the 19th century A.D.) continued to make extensive use of both food and uncoined metal as value standards and exchange media. Only rarely, in fact, were gold and silver coins treated differently from ingots and jewelry in the marketplace: they were weighed, tested, and exchanged at their bullion value no matter what the government of the period said the coins were worth.

Copper and iron coinage may be a different matter, however. Such coins seem often to have been exchanged at face value, particularly in the Roman and Chinese empires, and are in that sense perhaps the most "modern" of any of the moneys discussed here.

Big Money and Small Change

The problem of the *value* of nonmodern moneys is an especially interesting one both to economists and to the general public. When we read, for instance, that a Borneo gong could be purchased with twenty dollars' worth of glass beads, can we conclude that the gong is worth twenty dollars? Obviously not in any very meaningful sense; the dollar price depends entirely on the fact that one commodity—beads—is relatively scarce in Borneo. Likewise, we may read that a Greek coin was the equivalent of twenty modern dollars because it contains a sixth of an ounce of gold. Yet we also realize that originally that coin bought much more than twenty dollars does nowadays. And comparing the value of a Borneo gong with a Greek coin becomes absurd if we take the conversion-into-dollars approach. Both currencies, like almost all nonmodern money, lacked liquidity. We cannot conceive of an exchange on which they could be traded back and forth until a consensus about their relative value was reached.

A different approach has therefore been tried here. Instead of asking what each kind of money is worth in terms of other kinds, we have looked for records stating what each would normally buy. Moreover, we have focused as much as possible on the prices of food, figuring that the value of swords, slaves, and beads may vary arbitrarily in different societies while the value of food, being closely related to the minimum value of labor, should be fundamental and to a degree stable.

We find some surprising results when we look at nonmodern moneys in this way. For instance, the casual reader of the next few pages might think that the magnificent silver tetradrachms of the Greeks are the highest-denomination money shown. But he would be wrong. The tetradrachms were indeed moderately valuable pieces, in their day worth perhaps a week's labor by a skilled craftsman or a month's food for a farm family. They are small change, however, by comparison with the string of New Ireland pig money (*fig. 2*) or the *Dentalium* shells from Puget Sound (*fig. 3*), both of which were once worth many years' worth of food. Possession of just one of these automatically made its owner rich.

Each of the illustrations of money on the following pages has a letter with it in parentheses. *B* means "big money," a piece which originally had enough value in exchange to feed a family for a long period of time; *M* means that the piece is of "moderate" value, enough to feed the family for a few weeks; *S* indicates that the money is "small change" and would purchase no more than a few days' worth of food.

Kinds of Money

The bewildering array of nonmodern moneys that once existed may be assigned to four general categories: (1) metal coinage, (2) uncoined metal money, (3) shell money, and (4) a miscellaneous group which includes currencies made of food, fur, fiber, glass, teeth, and stone. The order in which they are named here is not an order of importance. Coins were indeed overwhelmingly important for a few hundred years; now, however, they have been largely replaced by an item from the fourth group —money made of plant fibers matted into paper.

Each of the first three groups has a geographical focus where it is known to have existed in especially great variety. Metal coinage is most variable, if not necessarily oldest, in the area bordering the eastern Mediterranean. Uncoined metal money centers in West Africa, and shell money was most prevalent in that southwestern Pacific region known as Melanesia. The miscellaneous group naturally has no single center of variation but is also common in Melanesia, an area as notable for its cultural diversity as for its inhabitants' interest in money.

Metal Coinage

We no longer believe, as economists once did, that the use of coinage is a necessary concomitant and cause of social and economic development. Many civilizations, including some very efficient and businesslike ones, have done quite well without coins and, indeed, without money of any sort.

But coins (that is, small and often disk-shaped metal ingots stamped with a more or less believable guarantee of uniform weight and purity) do have certain advantages. They are rather easier to use than uncoined metal currencies. They are often but not necessarily lighter and more compact than currencies of shell and foodstuffs. And—a decisive advantage—they can be easily monopolized by official bodies, giving governments an extraordinarily profitable source of revenue.

The notion that state-owned mints are revenue-raising institutions has been routinely denied by government spokesmen for some 2,500 years. Such spokesmen have traditionally argued that official control of money manufacture is a public service, promoting standardization and economic confidence. Yet it is significant that governments have on the whole been very insistent about providing this particular public service—grisly penalties for counterfeiters are as old as coinage itself, and every nation's history contains decrees forbidding barter and requiring the use of official coin in paying taxes and legalizing business transactions.

It is also significant that the idea of coinage spread with such remarkable speed after its invention in the 7th or 8th century B.C. Although both the Egyptians and Mesopotamians (the Sumerians, Assyrians, and Babylonians) had maintained highly complex economies for two thousand years without suffering from the lack of coinage, coined

3. *Strings of* Dentalium *shells from Puget Sound; 19th c., #87982, 14341 (B)*

4. *Silver* tetradrachm, *Greece, ca. 490-430 B C.; 26 mm, #302936 (M)*

7. *Silver* denarius *of Julius Caesar, Rome, ca. 50 B.C.; 20 mm, #195691 (M)*

10. *Copper* denarius *of Caesar Augustus, Rome, 27 B C.-A D 14; 27 mm, #194715 (S)*

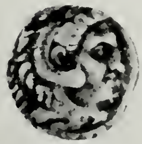
13. *Copper* as *of Marcus Aurelius, Rome, A.D. 161-180; 32 mm. #194759 (S)*

16. *Silver* shekel *of Tyre, ca. 300 B D.; 27 mm, #194697 (M)*

6. *Silver* tetradrachm *of Alexander the Great, ca. 336-323 B.C.; 25 mm, #303118 (M)*

9. *Silver* denarius *of Brutus, Rome, ca. 40 B C.; 18 mm, #195035 (M)*

12. *Copper* as *of Nero, Rome, A D. 57-68; 27 mm, #194725 (S)*



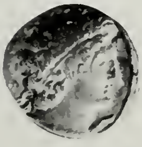
15. *Silver* tetradrachm *of Carthage, ca. 350 B C.; 23 mm, #303122 (M)*

5. *Silver* tetradrachm, *Greece, ca. 430-422 B C.; 24 mm, #303123 (M)*

8. *Silver* tetradrachm *of Marc Antony, Rome, ca. 30 B C.; 27 mm, #303131 (M)*

11. *Copper* as *of Hadrian, Rome, A.D. 117-138; 26 mm, #194748 (S)*

14. *Copper* follis *of Constantine I, Rome, A.D. 307-337; 21 mm, #301606 (S)*



17. *Silver* tetradrachm *of Ptolemy I, Egypt, 323-284 B.C.; 24 mm, #297467 (M)*

18. *Silver coins of Gupta period, India, A D 300-400(?) 10 mm, 12 mm, #194858, 194870 (M)*

19. *Silver coins, Sassanian per., Persia, A D. 200-600; 32 mm, 34 mm, #191185, 191103 (M)*

money came to be seen as absolutely essential almost as soon as it was invented. By 500 B.C. numerous underdeveloped kingdoms with primitive economies began competing to serve their publics by establishing mints. By the time of Christ, money manufacture was an official monopoly in every part of the Old World that possessed a moderately powerful central government.

Coins of Ancient Greece. The Greeks and their immediate neighbors used metallic coinage much earlier than the other civilizations of the Mediterranean and the Middle East. The Greek world was on a coinage standard by 500 B.C. at the latest, while such areas as Egypt, Babylonia, Persia, and Phoenicia continued to use grain money and uncoined bullion until 300 B.C. or even afterward. Considering that all these peoples were more economically developed than the Greeks in the year 500, it is clear that coin-using and economic development were not closely connected.

Silver was the chief currency metal among the Greeks, and the finest quality silver was traditionally Athenian. The owl-impressed tetradrachm of Athens (*figs. 4 and 5*) circulated widely through the region. But the fact that each city-state minted its own coins made standardization difficult and forced merchants to test each coin—some made by mints that were less scrupulous about short weighting and debasing than the mints of Athens—before accepting it. Not until the conquests of Alexander the Great was a genuinely international (though not always more trustworthy) coinage devised. This, represented here by a tetradrachm decorated with a head of Apollo (*fig. 6*), proved to be an esthetic and financial success. The Alexandrine coinage became so popular that imitations and descendants of it continued to circulate throughout the Mediterranean, the Middle East, and India for several hundred years.

Coins of Rome. Despite its power and international importance from 200 B.C. onward, Rome produced comparatively little coinage until the late days of the Republican Period and the establishment of the Empire by Caesar Augustus in 27 B.C. After that, coinage flowed in vast quantities from the imperial mints. It became the standard of the whole world west of central India and north of the Sahara.

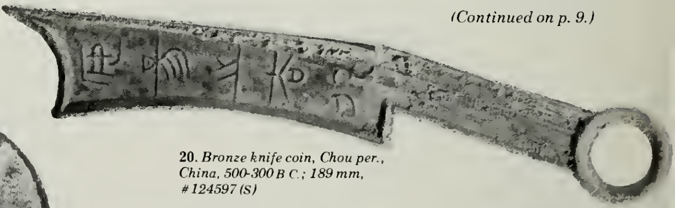
The coinage that set this standard was largely made of nonprecious metals, partly because the Roman emperors were chronically short of silver and gold (the Empire had an unfavorable balance of trade with India, Persia, and China) but also partly because Roman economists had begun to sense the importance of an adequate money supply in keeping an economy healthy. Three of the coins shown here (*figs. 7, 8, and 9*) are from the late Republican Period; like most surviving examples of this earlier coinage they are of silver. The five copper coins (*figs. 10-14*) span the history of the Empire from Caesar Augustus to the first Christian emperor, Constantine (A.D. 307-337).

Coins of Carthage, Egypt, and Tyre. The intensely commercial Phoenicians of Tyre and Sidon, as well as their former colonists at Carthage, came late to coin-using. The Sicilian-Punic coin shown here (*fig. 15*) is one of the earliest to have been minted by the Carthaginians; it is not earlier than 350 B.C. The Tyrian shekel (*fig. 16*) is even later, about 300 B.C. The tetradrachm (*fig. 17*) of Ptolemy I (one of Alexander's generals, who subsequently ruled Egypt—323 to 284 B.C.) may not have been used in Egypt at all except as payment for foreign mercenary troops. Egypt appears to have retained its old monetary system based on uncoined bullion and grain down to the eve of the Roman takeover at the end of the first century B.C.

Coins of India and Iran. India and Iran produced coins as early as 400 or 500 B.C. Indeed, coins of a sort, the so-called "Puranic" coins, may be as early in India as they are in China and the Mediterranean world. However, neither India nor Iran seems to have shifted completely to a coin economy until very late, despite centuries of familiarity with Greek and Roman moneys. The Indian examples shown (*fig. 18*) represent one of the earliest mass-circulation coinages to be produced there. They date to the Gupta Dynasty, probably between A.D. 300 and 400. The Iranian coins (*fig.*

(Continued on p. 9.)

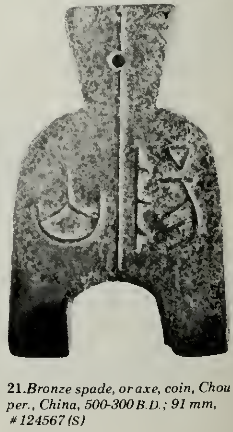
23. *Iron cash, Sung period, China, A.D. 1101-26; 32 mm, #124868 (S)*



20. *Bronze knife coin, Chou per., China, 500-300 B.C.; 189 mm, #124597 (S)*

24. *Bronze cash, Yuan or Mongol per., China; 39 mm, uncat. (M)*

22. *String of bronze cash, Ch'ing per., China, 17th-19th c. A.D., coin diam. 25 mm, #127902 (M)*



21. *Bronze spade, or axe, coin, Chou per., China, 500-300 B.D.; 91 mm, #124567 (S)*

"I Wear The Morning Star"

An Exhibition of American Indian Ghost Dance Objects Opens Saturday, November 6

Wovoka, the Paiute prophet, before 1921. Courtesy Nevada Historical Society

"A dramatic and powerful resurgence of traditional religious movements has taken place in contemporary Native American societies. The fires of the sweat lodges have been rekindled; the music of the sacred Sun Dance is again heard on the plains; the grandfather peyote is still honored in the rituals of the Native American Church; and the Ghost Dance, one of the most dramatic of ceremonies, is being sung and danced by Native Americans in the plains area."—*Ron Libertus, curator of the museum, Minneapolis Regional Native American Center.*

I Wear The Morning Star opened at the Minneapolis Institute of Arts earlier this year, as the first public exhibit of ritual Ghost Dance materials. It opens at the Field Museum November 6 with sixty ritual garments and other artifacts, photographs of 19th century Ghost Dances and continuous tapes of original Ghost Dance songs. The title of the exhibit, taken from one of those songs, was created by the Northern Arapaho—one of the more than thirty Plains Indian tribes which adapted the Ghost Dance of the Paiute to their own needs.

Ghost Dance was a religious movement, borne of one man's impressive visions. Around 1889, Wovoka, a Paiute in Nevada, began passing on to his people messages he believed he received from God: "Live peacefully, do not lie, work hard." As the introduction in the handsome catalog accompanying the exhibit states, "beside this general ethic, God gave Wovoka directions for dancing . . . the Ghost Dance, and further advised him that if Indians would live and act in the prescribed manner, they would soon experience a remaking of their (own) world . . . . Threatened with poverty, subjection, and extinction, tribes rapidly took up this doctrine of hope.

Men and women in thirty tribes (including Sioux, Pawnee, Cheyenne, Navaho, Crow, and Shoshoni) accepted the Ghost Dance with its glorious promise of a return of the buffalo, and dead friends and relatives, and the disappearance of the white man. The white man misinterpreted the pacifism of the new religion. When a handful of whites at Pine Ridge Agency overreacted to Sioux who ignored Wovoka's warning against violence, the result was the infamous massacre at Wounded Knee (Dec. 29, 1890).

The muslin and buckskin shirts and dresses shown in this exhibit were created by early Ghost Dancers exclusively for their own participation in the ritual performance. Designs and decorations usually reflected each wearer's personal vision of a garment which would "lift the wearer out of danger when the tidal wave swept the white man off the earth." Hence, the basic designs were air symbols—birds, rainbows, stars. Sioux who participated also believed their Ghost Dance shirts were bulletproof, a tragic misbelief borne out at Wounded Knee.

field briefs

Staff Appointments

Judy "Gail" Armstrong has been appointed custodian of collections, Department of Geology. She holds an M.S. in biology (paleontology) from Wayne State University and served as assistant curator of Wayne State's Museum of Natural History. Ms. Armstrong succeeds Katherine Kreuger, who resigned from the post.

Gordon C. Baird joined the geology staff in August as assistant curator of fossil invertebrates. He received his Ph.D. from the University of Rochester (New York). His doctoral dissertation was on regional variation in the ecology of ancient animal communities.

David A. Cawthon has been named research assistant in the Division of Invertebrates. He holds an M.S. in biological sciences from the University of Illinois, where he did work on population ecology of grain insects.

Lucy A. Drews has joined the Museum as a library specialist. She holds an A.M.L.S. in library science from the University of Michigan and has served on the University of Cincinnati library staff.

John J. Fay, who holds a Ph.D. in biology from the City University of New York, is now serving as visiting assistant curator of botany. Most recently he was a botanist at Pacific Tropical Botanical Garden, Lawai, Hawaii.

Victoria Grigelaitis is a new assistant in the Department of Education, where she works on the adult education program, environmental field trips, and the weekend volunteer program. She received her B.A. in Spanish from Roosevelt University.

Michael E. Moseley has been named associate curator, Middle and South American archaeology and ethnology. He holds a Ph.D. from Harvard University and most recently was associate professor of anthropology at Harvard and associate curator at Peabody Museum, Harvard.

Alan Resetar is the new custodian of the herpetology collection, Division of Reptiles and Amphibians, where he formerly served as a volunteer. He succeeds Ray Bernard, who has left the Museum to continue his education.

Carol Scholl has joined the Department of Education as instructor in geology. She holds an M.A. in geology from Kent State University and has most recently served as a staff geologist for an environmental consulting firm.

Ayer Series for November

The Edward E. Ayer Film/Lecture Series opened its fall series in the beautifully renovated James Simpson Theatre. The series continues in November with four outstanding presentations. Nov. 6: Kenneth Armstrong, "Australia—Great Land Down Under"; Nov. 13: John Goddard, "Exploring African Wonderlands"; Nov. 20: Ted Walker, "The Sea and Shore of Baja"; and Nov. 27: Quentin Keynes, "Search for the Twisting Makonde." Starting time is 2:30 p.m.

Kroc Environmental Education Program Offers Lecture/Films

Sunday, November 14, and Sunday, December 5, are the dates to remember as the Ray A. Kroc Environmental Education Program brings two exciting nature film/lectures to Field Museum. Both will be presented in the newly reopened James Simpson Theatre.

The World the Eye Cannot See, presented by John Paling, brings together a selection of animals and plants whose lifestyles could never have been revealed except by the specialist cameras of Oxford Scientific Films. Honeybees as seen by high-speed photography that reveals surprising views of the way they enter and leave their hives; driver ants and leafcutter ants; hummingbirds in high speed shots showing actual pollination of exotic tropical flowers; carnivorous plants so highly specialized that they show some animal characteristics; the Trinidad annual carnival of insects; and other views of animal behavior make up this exciting and rare film. The film/lecture will be presented at 7:00 p.m. Coffee will be served afterward and visitors will have the opportunity to meet Dr. Paling, a former lecturer at Oxford University.

Living among Whales, to be presented by Roger Payne on December 5, includes exclusive and rare footage on the lives of right whales, perhaps the rarest of all whales. Dr. Payne is perhaps best known as the first scientist to recognize the repeated pattern of "songs" emitted by humpback whales. He has spent the last sixteen years doing research in biological acoustics and is currently at the Institute for Research in Animal Behavior, operated jointly by the New York Zoological Society and Rockefeller University. The film lecture begins at 2:30 p.m.

Nature Camera Club Features African Safari Slide/Lecture

Guest speaker for the Tuesday, November 9, meeting of the Nature Camera Club of Chicago will be Harry Hirsch, noted amateur wildlife photographer. The title of Mr. Hirsch's slide show will be "Elephant Walk, the Fifth Safari," featuring animals of southern Africa. The program will begin at 7:45 p.m. All interested persons are invited to attend.

Membership Tops 25,000!

Since the first of the year more than 1,900 new names have been added to Field Museum's membership roster. Dorothy Roder, membership secretary, reports that the membership total at the end of September was 25,092—an 8.3% increase for the nine-month period since January 1, when the total was 23,145. Five years earlier the membership was at 19,342, and ten years earlier there were 9,581 members.

Museum Guides Now Available in Japanese and Spanish

Japanese- and Spanish-reading visitors to Field Museum now have the option of using guide books to the Museum in either of these languages. The translations are otherwise identical to the new English language *Visitor Guide*, showing detailed floor plans as well as providing basic factual information about the Museum. Although editions of the guide in other languages are not yet available, Museum staff members speak an astonishing variety of European and Asian languages and are available to interpret or answer questions of visitors who cannot communicate in English.

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Free distribution	1,596	1,503
Total distribution	25,136	26,413
Office use, left-over	3,726	3,587
Total	28,863	30,000

I certify that the statements made by me above are correct and complete.—Norman W. Nelson, Asst. Dir., Admin.

Members' Tours to Egypt

Sponsored jointly by Field Museum and the Oriental Institute

Karnak, Luxor, Abu Simbel! These are some of the legendary sites in Egypt that will be visited by Museum members this winter. Seven separate, but similar, tours, with Chicago departures December through March, will visit major sites of the ancient Egyptian kingdoms as well as many of the Islamic, early Christian, and Classical monuments.

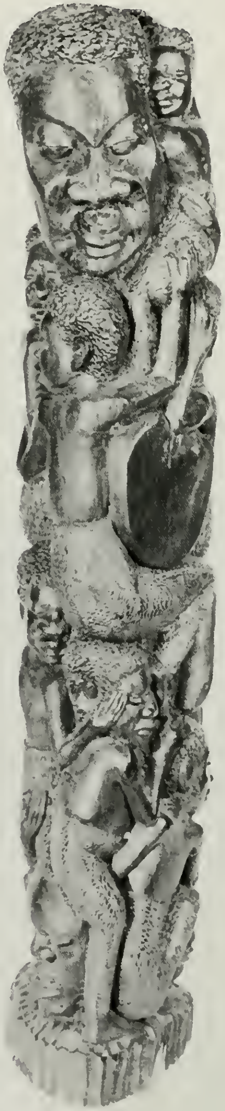
Each of the 18-day, 17-night tours, limited to twenty persons each, will be accompanied by an Egyptologist from the Oriental Institute. In addition to the numerous historic sites, superb museum collections in Egypt will be visited, and special arrangements have been made to acquaint members first-hand with the activities of the Epigraphic Survey at Chicago House, Luxor. There will also be an excursion by boat between Aswan and Luxor. Four of the tours, all identical, will travel *downstream* on the Nile; three tours, all identical, will travel *upstream*. Tour dates are (#1) Dec. 29-Jan. 15; (#2A and #2B) Jan. 8-25; (#3) Jan. 15-Feb. 1; (#4) Jan. 29-Feb. 15; (#5) February—dates to be announced; (#6) March 12-29; (#7) March—dates to be announced.

Total cost of each tour, per person, is $2,385.00, which includes a tax-deductible contribution of $500.00 to Field Museum. The tour price also includes air fare and all other transportation and transfers, hotels (double occupancy), meals, and gratuities. Itineraries, registration forms, and other information may be obtained by writing or calling Dorothy Roder, membership secretary, Field Museum (922-9410, ext. 206). If writing for an itinerary, please specify preferred tour number.

Interior of Great Temple at Abu Simbel, Egypt, built by Rameses II. Courtesy of the Oriental Institute

Ebony Carvings from Africa Highlight Holiday Offerings at Field Museum Shops

25% off to Members until November 30



"Tree of Life," 6"x28"
$200.00 (less discount)

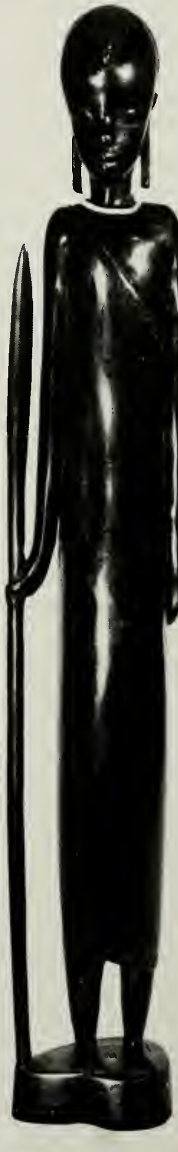
A selection of beautifully carved ebony sculptures from East Africa are stealing the show at the Field Museum shops. What's more, the sculptures are on sale—*to Members only!*—at 25% off (this includes the customary 10% discount for Members). The sale lasts only through November 30. The collection of 34 carvings from Tanzania includes 18 Makonde pieces and 16 Masai figures. The Makonde carvings are an intriguing response to change in Africa, mixing traditional techniques and concepts with Western art consciousness. Three distinct styles are demonstrated. In "Tree of Life" (at left) naturalistic figures are worked together in sculptures that retain the form and spirit of the tree trunk; relief panels show more stylized figures in everyday pursuits.

The "spirit" carvings are unique latticeworks of elastic, attenuated dream figures; the warrior figures (like that at right) are a more direct response to Western naturalism, capturing in ebony the grace and dignity of the Masai people. The largest of these pieces is more than 30 inches tall. Prices range from $55 to $250 (less 25% discount for members!). Stock is limited, so select your sculpture now.

Holiday and Note Cards include a new selection illustrated with details from Ch'ing Dynasty beaded belts in the Field Museum Chinese collection. These tastefully innovative greeting cards (imprinted with "Season's Greetings," or "Holiday Greetings," or with no message) are available with envelopes for $2.50 for a box of 25 (10% discount for Members).

Metropolitan Museum of Art Engagement Calendar for 1977 features art treasures from the tomb of Tutankhamun, the Egyptian boy-king; 56 stunning four-color plates are included in this 116-page calendar. Comes already boxed—ready for gift mailing. $3.75 (less 10% for Members).

Mail orders for greeting cards or engagement calendar should be addressed to: Gift Shop, Field Museum of Natural History, Roosevelt Rd. at Lake Shore Dr., Chicago, Ill. 60605 Illinois residents include 5% sales tax. All orders should include 40c per item for postage and handling.



Masai figure, 5"X31"
$55.00 (less discount)

(Continued from p. 8.)

19) are of similar date and were minted under the Sassanians, arch-enemies and close trading partners of the Romans.

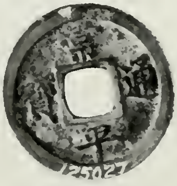
Coins of China. The Chinese may have been the first in the world to make a coin-based money system universal within their society. The Greeks began experimenting with coins as early as the Chinese, but their silver coinage remained an upper-class, big business currency down to the time when they joined the Roman Empire, while China had been turning out a cheap bronze coinage made of a copper-tin-lead alloy since 500 B.C. The Chinese had in fact no high-value coinage. They continued to use uncoined silver ingots for large transactions until the 16th century A.D.

The most ancient Chinese coins are in the shape of tools, perhaps a legacy from a time when actual tools, as in parts of 18th-19th century West Africa, functioned as media of exchange. Best known among these early tool-coins are the axe (or spade) and knife moneys of the Chou Dynasty; both of the types illustrated here (*figs. 20-21*) date to somewhere between 500 and 250 B.C. However, a more uncommon type of Chou coin proved to be the money of the future: a disk with a hole in the center. Such pierced round coins, often called "cash" by Westerners, became the standard Chinese money by 200 B.C. and remained so for the next 2,000 years.

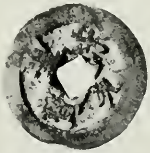
A string of 370 ordinary cash (*fig. 22*) acquired in Peking in 1908, as well as two unsuccessful monetary experiments of earlier times are shown on page 8. One (*fig. 23*) is a cash made of iron dating to A.D. 1101-26. The other (*fig. 24*) is an extra-large cash theoretically worth a thousand of the ordinary variety, issued by a Mongol emperor in 1310. All three experiments were made for the same reason: because the Chinese government hoped to economize on copper, the market price of which was often very close to the cost of the metal in a standard cash. None of these indirect attempts at debasement met with public acceptance, however. In spite of their weight—a major business deal might involve several thousand pounds of coin—strings of cash in the ancient design remained the only real money to the Chinese for almost fifty generations.

Korean and Vietnamese Coins. Like the coinage of Rome, Chinese coins circulated far beyond the borders of the country of origin. As early as the Han Dynasty (221 B.C.-A.D. 224) we find government decrees forbidding the export of coinage in an effort to halt a potentially disastrous drain of copper abroad. The decrees seem to have had little effect. So much coinage was exported that the Chinese cash became a, and often *the*, normal domestic exchange medium for most of east and southeast Asia.

It is therefore understandable that the earliest known coinages produced locally in Vietnam, Korea, and Japan followed the Chinese model. The examples shown here are typical: A Korean cash of unknown age inscribed *Ch'ang-p'ing* (*fig. 25*) and a Vietnamese cash of the Sheng-yuan period, about A.D. 1400 (*fig. 26*). Other uncoined moneys did circulate in both places, however. The Vietnamese, for instance, almost certainly used silver ingots.



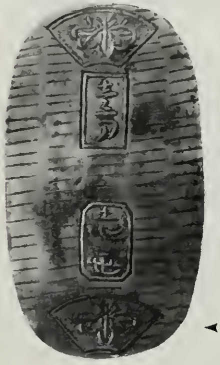
25. *Bronze cash, Korea, age unknown, 30 mm, #125027 (S)*

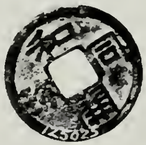


26. *Bronze cash, Sheng-yuan per., Vietnam, ca. A.D. 1400; 25 mm, uncat. (S)*

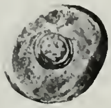
Coins of Japan. As with those of Vietnam and Korea, the earliest native Japanese coins were modeled on Chinese prototypes. Figure 26a shows what is believed to be the earliest of these, one of the *Wado kaichin* which dates to the reign of the emperor Gemmei in the 8th century A.D. Chinese-type money continued to circulate in Japan for many centuries, being used side-by-side with uncoined gold and silver.

In the 14th century, however, the Japanese began doing something the Chinese never tried: they introduced a high-value precious metal coinage. The example shown is a gold *ryo* of 1558-69 (*fig. 27*), a second *ryo*, or *koban*, of 1533-35 (*fig. 28*), and an *oban* produced in 1588 (*page 3, fig. 1*). All were of enormous value and rarely entered into ordinary purchases and business deals. Great nobles occasionally paid their obans out for horses, swords, or castles; ordinary people made do with ingots, rice, and Chinese-style cash.





26a. *Bronze cash, or* wado kaichin, *Japan, 8th c. A.D.; 24 mm, #125025 (S)*



28. *Gold* koban, *Ashikaga per., Japan, A.D. 1533-35; facsim. 20 mm, #26971 (B)*

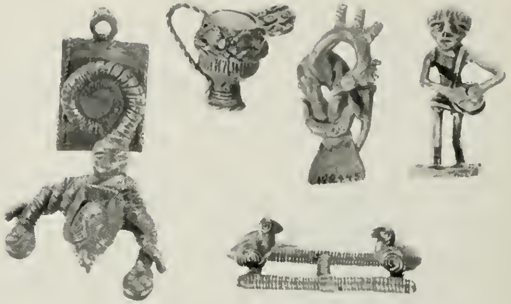
◄ 27. *Gold* ryo, *Ashikaga per., Japan, A.D. 1558-69, facsim. 62 mm, #26947 (B)*

Uncoined Metal Moneys

Whether or not shaped into coins, metals in general made good money; they are durable, often scarce, often valuable in proportion to weight and bulk, and difficult to imitate using another, less scarce material. With the significant exception of the ancient Peruvians and the native copper-using cultures of the United States and Canada, all peoples with knowledge of metals have used them in monetary roles. Many have formed their metals into coins. Just as many, however, have preferred to use uncoined metal as money, either by (a) leaving it in a raw ingot or nugget form, or (b) shaping it into useful or decorative objects and using these as exchange media.

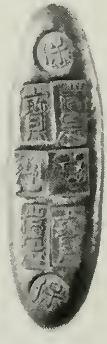
Ingots, Nuggets, and Dust. Raw metals used as money include almost the entire range of metallic elements and alloys known to antiquity: gold, silver, iron, copper, lead, tin, zinc (in brass), and nickel (in nickel silver, a copper-zinc-nickel alloy). Only two examples are shown here: a tin "hat money" ingot (*fig. 38*) from 19th century Malaysia and a copper-lead-silver "beancake money" ingot (*fig. 35*) from 17th-19th century Japan. The hat and beancake moneys have been given a definite shape and stamped with dies to indicate purity. If any of the people who used them had trusted these marks, rather than routinely testing each ingot before accepting it, the Malay and Japanese examples could be considered coinage.

The key to a successful monetary system based on raw metals is a widely accepted system of weights and measures, which is why weights and units of money often bear the same name, like the British *pound*, the Italian *lira*, the Thai *baht*, and the Biblical *talent.* Figures 29-34, 36, and 37 illustrate weighing systems for gold and silver: two Sumerian one- and three-*mina* weights made of hematite (*fig, 34*), dated to about 2300 B.C.; a Chinese pocket scale from the 19th century A.D. (*fig. 37*); a group of the deadly scarlet and black seeds of the precatory bean (*fig. 36*) which, under the name "rati," served as the standard weight unit for precious metal in ancient India and Southeast Asia; and five of the famous brass Ashanti gold weights from 19th century Ghana (*figs. 29-33*). It is worth noting, however, that very few ancient systems of weights seem very precise when checked on modern scales. The large variation among weights supposedly of the same value is sometimes explained by deficiencies in ancient manufacturing techniques. It is sometimes also explained by deliberate fraud. Constant weighing and testing was no guarantee against being cheated.



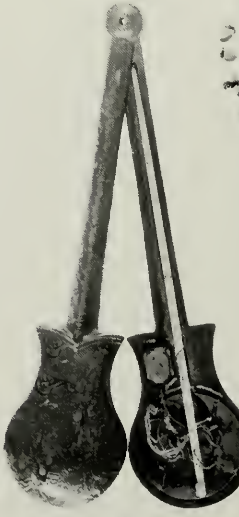
29-33. *Five brass gold-weights, Ashanti, Ghana, 18th-19th c., A D ; 50-81 mm, #84698, 172445, -62, -70, 195346*

34. *Two hematite gold weights, Early Dynastic per., Sumeria, ca. 2300 B.C.; 57 mm, 24 mm. #228521, 231471*

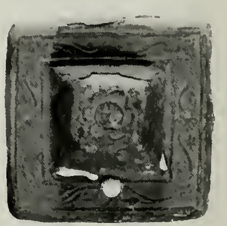


35. *Copper-lead-silver "beancake" money, Japan, 17th-18th c. A.D.; 89 mm, #27270 (M)*

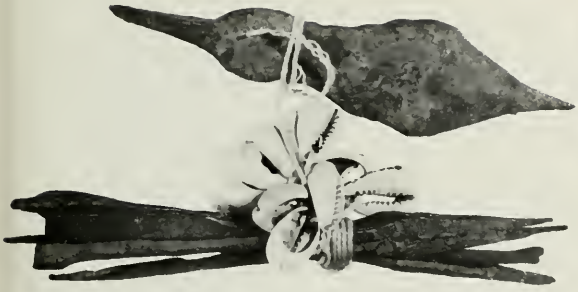
36. *Precatory beans (*Abrus precatorius*) used as gold weights; India, S.E. Asia, 500 B.C.-A.D. 1900; diam. 5mm*



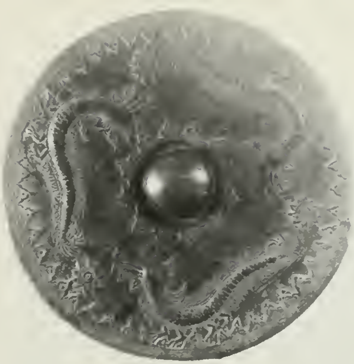
37. *Portable lacquer scale for precious metals, China, 18th-19th c. A.D.; 141 mm, #235153*



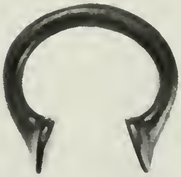
38. *Tin "hat money" ingot, so-named because of peaked shape; Malay peninsula, 19th c. A.D.; 45 mm, #292161 (S)*



44. *Iron money with cowries, S. Cameroon, 19th c. A D ; 131 mm, #221028 (S?)*



39. *Bronze gong (of Chinese manufacture?), Borneo, 19th c. A.D.; 396 mm, #87071 (M-B)*



42. Manilla *bracelet, Nigeria, 19th c. A D ; 58 mm, #226651 (S)*

45. *Bronze* kumah *ring, used as bridewealth, N. Nigeria, 19th c. A D ; 25 mm, #221763 (S-M)*

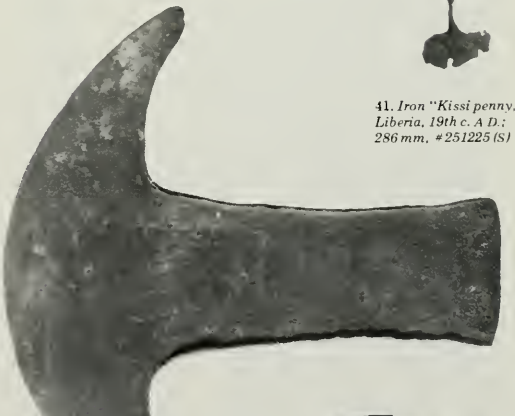
41. *Iron "Kissi penny," Liberia, 19th c. A D.; 286 mm, #251225 (S)*

Shaped Metal Moneys. Regular weighing is also a feature of the use of certain of the second group of uncoined metal moneys, those shaped into useful or decorative objects. The splendid gong (*fig. 39*) and cannon (*shown on cover*) currencies of Borneo were so treated, each piece being valued largely by weight; a slight surcharge was applied when, as in the case of the large gong shown here, the piece was of unusually old and fine workmanship. The same may have been true of the unique copper axe currency (*fig. 40*) of the Aztecs and their neighbors in 15th century Mexico, unique because—in spite of the abundance of precious metals and the high level of metallurgical knowledge in several areas—it is the only metal money known from the pre-Columbian New World.

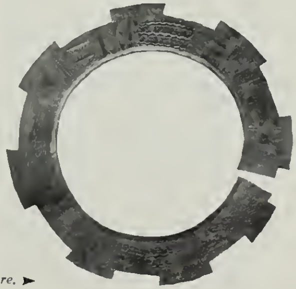
Constant weighing of unprecious shaped money was less common in the heartland of such currencies—west Africa between the 15th and 19th centuries. In this respect some of the African moneys came very close to modern coinage, especially the widely used Kissi "pennies" of Liberia (*fig. 41*) and the *manilla* bracelets of the entire coastal region (*fig. 42*), notorious because of their close early connection with the slave trade. Other sorts of African metal money seem to have varied in value according to size, like the brass collar money of the Bateke in Zaire (*fig. 43*), the various iron tool moneys of Nigeria, the Cameroons, and Gabon (*fig. 44*), and the *kumah* earrings (which may have served as money only in bridewealth exchanges) of the Mubi in northern Nigeria (*fig. 45*).

Shell Money

The third of the world's premodern moneys to be considered here—and probably the oldest—are those made of shell. The material is as natural for the part as is metal, for the shells of many species of mollusc are small, relatively uniform in size, and rare everywhere except along that stretch of coast



40. *Copper axe money, Aztec, Mexico, A D. 300-1500; 137 mm, #23725 (M)*



43. *Brass collar money, Bateke, Zaire,* ➤ *19th c. A.D.; 292 mm, #91276 (M)* where those species occur. Shells are in fact even harder to counterfeit than metal coins, although one occasionally sees laboriously carved bone copies of money shells, some of which may have been made with fraudulent intent.

Money made from shells has been used at one time or another in most places, but the great majority of known varieties come from just one area, Melanesia. More kinds of shell money are or were used in Melanesia than in all the rest of the world combined.

Shell Disk Moneys. The commonest shell moneys in Melanesia are strings of small disks made by grinding large numbers of flat shell fragments into a circular shape, putting holes in them, and stringing them on vines or fiber cords. Similar sorts of disk-shaped beads are currently popular in the United States as jewelry.

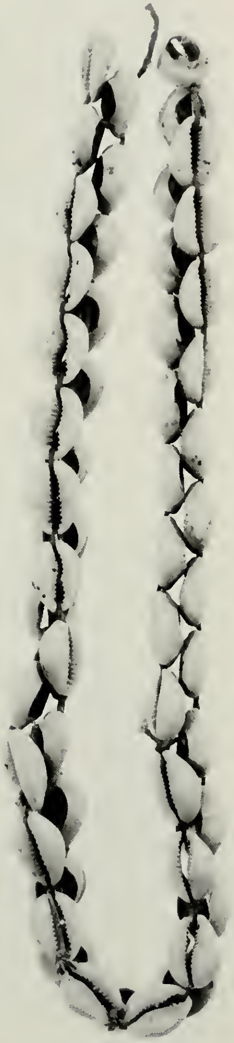
Several kinds of Melanesian disk moneys are illustrated here: white, blue, and red *pele* from the Duke of York Islands (*fig. 46*), a strikingly handsome black-and-white money from northern New Ireland (*fig. 47*), a small number of large disks, said to have been used as money, from the Solomons (*fig. 48*). The handsome shell and glass-bead belt from New Britain (*fig. 49*) may have been used more as a costume accessory than as money, although the shells on it could have served to purchase other things if the need arose.

Most of these closely resemble the well known *wampum* of the North American Indians. No wampum is shown here. While it was used monetarily by the French and British settlers (wampum was legal tender in the British colonies until the 1740s), it seems never to have functioned as money among the Indians themselves.

Cowries. Curiously, the greatest of all the money shells was little used in Melanesia: the small, infolded shell known as the cowrie. Originating in the Indian Ocean and parts of the Pacific, the cowrie was used as money in a great variety of places—ancient China and India, parts of New Guinea, perhaps in Egypt and North America, and almost everywhere in Africa down to the present day. It is said to have had the widest circulation of any single kind of money that has ever existed. No modern currency circulates in nearly as many places as did the cowrie during the past.

Travelers and economists tend to become enthusiastic on the subject of the cowrie. One economist says, "The surface and shape are attractive and decorative. . . . They are easier, cleaner, and pleasanter to handle than coins, which are usually regarded as ideal; they are as easy to count in pairs, in

46. *White shell disk money, Duke of York Isls., late 19th c. A.D.; #106049 (S)*



50. *Cowrie shells, Nigeria, ca. 1890; #29681 (S)*

48. *String of shell disks, supposedly money, Solomon Isls., 19th c. A.D.; shell diam. 50 mm. #276740*

51. *Imitation cowrie shell made of horn; China, 800-600 B.C.; 21 mm, #121058* quartettes, or in fives, and practically impossible to counterfeit . . . and cowries surpass all other shell currencies in solidity and uniformity."

Since all cowries look pretty much the same, only two examples have been included here: a short string of them collected in the 19th century in northern Nigeria (*fig. 50*), where the individual shells were being used as very small change, and a fake cowrie carved from bone and excavated in the northern Chinese province of Honan (*fig. 51*). A green color and inscriptions on the back of the latter were added by a modern Chinese antique dealer.

Other Shell Moneys. Besides cowries and strung disks, shell moneys have been made in numerous other forms. Notable among these are the grooved arm rings of Tanga Island in the Bismarcks (*fig. 52*), laboriously ground from the massive shells of the giant *Tridacna* clam, wide specimens of which are worth large sums in local trading. The New Ireland pendant (*fig. 53*) is also a big-money item. The eyelike decoration in the center is the only part

47. *Black-and-white shell disk money. Cape St. Alaric, New Ireland, 19th c. A.D.; #106082 (S?)*

52. *Shell arm-ring money, Tanga Is., Bismarck Arch., 19th c., 85 mm diam., #136769 (M)*

53. *Fiber and shell pendant, New Ireland, 19th c., #106104 (B)*

49. *Girdle of money shells and glass beads, Admiralty Isls., 19th c. A.D. #997744 (M)*

made from shell—it is the operculum, or "door," from the shell of a species of marine snail.

Whether a flat piece of pearl shell with a fiber tail from Yap, in Micronesia, is actual money is unclear in the Museum records, but the turtle shell tray from nearby Palau (*fig. 54*) definitely qualifies. Made and used exclusively by women, such trays enter into numerous business transactions.

The one example of New World shell money pictured on page 6 (*fig. 3*) is perhaps the most valuable of all in terms of original purchasing power. Similar strings of *Dentalium* shells served as exchange media from British Columbia south into northern California. This example comes from the Puget Sound area, where it was equal in value to one or two slaves. The bone object shown on page 14 (*fig. 55*) is a purse for holding *Dentalium* shells made by the Yurok Indians, among whom acquiring such shells was as much an obsession as is acquiring dollars among some modern Americans.

Money from Food, Fur, Fiber Glass, Teeth, and Stone

While the great bulk of nonmodern moneys were made of either metal or shell, there are important exceptions. Some of these are represented here.

54. *Women's money of turtle shell, Palau Is., Carolines, 20th c., 175 mm, #252623(S)*

55. *Bone purse for* Dentalium *shells, Yurok Indians, Calif., 19th c., 140 mm, #86673*

Edible Money. A very major exception to metal or shell moneys is money consisting of foodstuffs; indeed, food (and on occasion, drugs) served as small change in nearly all early economies which made use of money. However, some people enjoyed foodstuff moneys much more elaborately.

Barley and wheat were as important as silver and gold to businessmen in ancient Egypt and the Middle East. While in Sumer and Assyria grain was a common exchange medium but rarely a unit of account, in Egypt it had all the functions of true money. Prices were routinely expressed in bushels of barley. It was even possible to deposit barley in special banks and to write checks and letters of credit against those deposits when buying other kinds of goods. Rice played a similar role in the great civilizations of Southeast Asia, although without the refinement of a grain banking system. Standard measures of unhusked rice were an accounting unit and a means of payment in ancient Java, and rice survives as an exchange medium for small transactions in most of the rural parts of Asia where it is grown.

Cocoa or cacao beans among the ancient Aztecs and Mayas are an even more famous example of foodstuff currencies. The Spanish conquistadores of Mexico and Guatemala were amazed to find that cocoa beans served not just as small-change money but as the fundamental money for local and international trade throughout the region. Peter Martyr, one of the more impressionable Spanish observers, wrote

> *O blessed money which yieldeth sweete and profitable drink for mankind and preserves the possessors thereof from the hellish pestilence of avarice because it cannot be long kept or hid underground!*

Peter Martyr underestimated the lengths to which avarice will go, however. Reliable reports exist of cacao beans which had been laboriously hollowed out and filled with clay to make them heavier and seem more fresh.

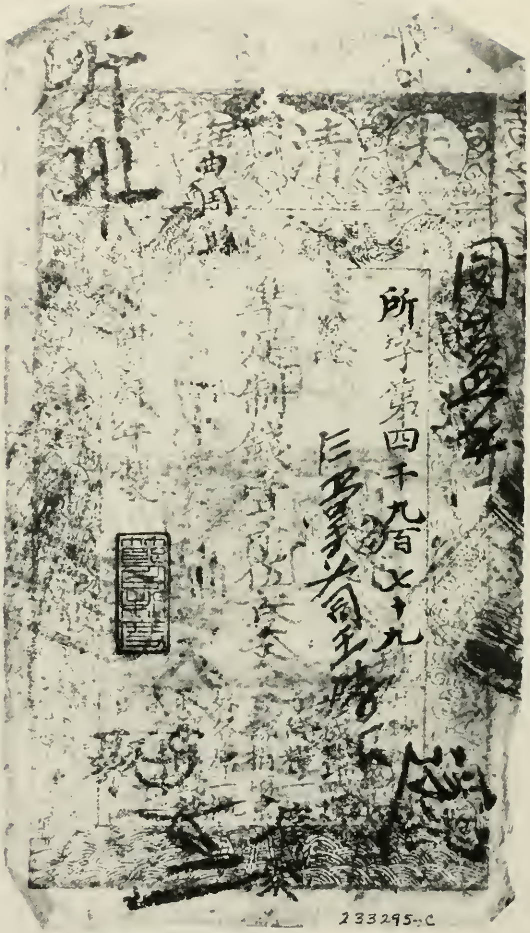
Stone, Fur, Teeth, Glass. Regrettably, we cannot show an example of one of the most famous of all nonmodern currencies, the millstonelike money of Yap, in Micronesia. Carved from volcanic stone and weighing up to several hundred pounds, the Yap "coins" are a subject of controversy among experts, some of whom feel they qualify as money and some of whom think not. Since there are none in Field Museum's collection, we shall not have to face the issue here.

The exhibition does include several other moneys of considerable interest, however: exceedingly valuable stone beads manufactured by the Pomo Indians of California, the almost equally precious dog tooth money of the Admiralties and bat tooth currencies of the Solomon Islands, a curious lanyardlike object (supposedly a spear-thrower) braided with flying fox fur from New Caledonia, and a string of the familiar glass *aggry* beads of West Africa. The aggries which the Portuguese found in circulation there when they first arrived in the 16th century were enormously valuable, so attempts to copy them in European factories began almost immediately. Many such attempts failed, but enough succeeded so that by 1875 the region had become flooded with good imitations. After that the *aggry* underwent severe inflation and declined to the status of costume jewelry and small change.

Money of Plant Fiber. The final kind of currency to be considered here differs from most of the other moneys discussed so far. It is not durable, not especially pleasant to handle, and not intrinsically rare. Nonetheless, it is important. Money made of plant fibers formed into sheets and printed with ink—that is, paper money—made its first appearance about A.D. 1000 as yet another of the experiments tried by Chinese governments to cut down on the cost of money manufacture. The new invention was greeted with widespread suspicion and was soon dropped only to be revived again by a whole series of later Chinese governments, all with financial problems of their own.

The Chinese bill shown here (*fig. 56*) is quite late, dating from 1851 and having a face value of 1,500 cash. However, it closely resembles earlier moneys going back as far as the early Ming Dynasty, about 1400, and may not be dissimilar from that first of all paper bills from A.D. 1000.

The continuing Far Eastern experiments with paper money eventually met success in a roundabout way. The Europeans had long been conscious of the existence of Chinese paper money (it was first described by Marco Polo) and had for several centuries used letters of credit, checks, and other financial instruments written or printed on paper. By the 17th century this tradition had developed to the point where banks were issuing "bank notes"—in essence, negotiable deposit certificates which, as someone eventually realized, were in fact embryonic paper money. The final step was taken in 1704 when the British government agreed to recognize the notes issued by the Bank of England, a quasi-governmental body, as legal tender. Europeans had at last graduated to the use of true paper money, at least partly in imitation of the Chinese experiments begun some 800 years before.



56. *Paper money, worth 1,500 cash, Ch'ing per., China, A D 1854; 228 mm. #233295 (M)*

The old/new invention became instantly popular with the more improvident Western governments, many of whom (like the Continental Congress in the early days of the American Republic) had many liabilities and few assets other than a printing press. By the end of the 19th century the idea had spread back as far as China and Japan. Today all Far Eastern nations make extensive and successful use of paper moneys. However, the bills they use are adaptations of Western money, not direct survivals of the concept they themselves pioneered.

November at Field Museum

NEW EXHIBITS

I Wear the Morning Star—opens November 6. An exhibit of traditional ceremonial painted garments and objects designed by the Western Plains Indians in the late 19th century for the religious Ghost Dance movement. *Hall 9*

Male and Female: Anthropology Game. This exhibit lets you look, as an anthropologist would, at 38 artifacts from the museum's great collections. It's a fascinating way to discover that economic and social roles of the sexes are not universally the same. *South Lounge, second floor*

NEW PROGRAM

Ray A. Kroc Environmental Education Program: *The World that the Eye Cannot See.* A film/lecture illustrating forms of nature that could never be revealed without the aid of special cameras. Sunday, Nov. 14, 7:00 p.m. *Simpson Theatre, ground floor.*

SPECIAL PROGRAMS

Edward E. Ayer Film/Lecture Series. A film/lecture series highlighting remote areas of the world. Saturdays through Nov. 27, 2:30 p.m. *Simpson Theatre, ground floor*

Nov. 6: Kenneth Armstrong: *Australia—Great Land Down Under*
Nov. 13: John Goddard: *Exploring African Wonderlands*
Nov. 20: Ted Walker: *The Sea and Shore of Baja*
Nov. 27: Quentin Keynes: *Search for the Twisting Makonde*

Man in His Environment Film Series. These films expand on the topics in the museum's *Man in His Environment* exhibit or introduce concepts beyond those of the exhibit. Films are shown at 11:00 a.m. and 1:00 p.m. *Meeting Room, second floor north.*

The November theme is "Human Alternatives: Key Environmental Problems that we Now Must Face."

Nov. 5, 6, 7: *Pollution: A Matter of Choice*
Nov. 12, 13, 14: *But is This Progress?*
Nov. 19, 20, 21: *Energy to Burn*
Urban Alternatives
Nov. 26, 27, 28: *Great Sea Farm*
Should Oceans Meet?

SPECIAL EXHIBITS

Man in His Environment. This exhibit takes a global view of some of the most serious environmental problems now confronting all mankind and asks visitors to involve themselves in these problems—and the need for solution. *Hall 18.*

Pliny's Natural History: The First Encyclopedia. Pliny (AD 23-79), compiled what has been called the first encyclopedia—viewed today as an astonishing mixture of fact and fiction. Two rare editions (1513 and 1530) of this work are on view in the *South Lounge, second floor.*

Pterosaur. A stylized model of the largest known flying creature—an extinct pterosaur—spreads its wings across Stanley Field Hall to dramatize a special exhibit of pterosaur fossils in the *Northwest Arcade, second floor.*

CONTINUING PROGRAMS

The Ancient Art of Weaving. Members of the North Shore Weavers' Guild demonstrate weaving and spinning every Monday, Wednesday, and Friday, 10:00 a.m. to 12:00 p.m. *South Lounge, second floor.*

Saturday Discovery Programs. Every Saturday, 11:00 a.m. to 3:00 p.m., you are invited to take tours, follow demonstrations, and participate in special museum-related activities.

Autumn Journey for Children: *My Kind of Town.* A self-guided tour about the animals, geology, and early history of the Chicago area. Journey sheets are available at the information booth.

SPECIAL-INTEREST MEETINGS OPEN TO THE PUBLIC

Nov. 2, 7:30 p.m.	*Kennicott Club*
Nov. 5, 8:00 p.m.	*Chicago Anthropological Society*
Nov. 9, 7:30 p.m.	*Nature Camera Club*
8:00 p.m.	*Chicagoland Glider Council*
Nov. 10, 7:00 p.m.	*Chicago Ornithological Society*
7:30 p.m.	*Windy City Grotto, National Speleological Society*
Nov. 11, 8:00 p.m.	*Chicago Mountaineering Club*
Nov. 14, 2:00 p.m.	*Chicago Shell Club*
Nov. 16, 7:30 p.m.	*Chicago Audubon Society*
Nov. 17, 8:00 p.m.	*Illinois Mycological Society*

COMING IN DECEMBER

Ray A. Kroc Environmental Education Program: *Living Among Whales.* A film and lecture on the lives of right whales—perhaps the rarest species of large whales. Sunday, Dec. 5, 2:30 p.m. *Simpson Theatre, ground floor.*

NOVEMBER HOURS

The Museum Opens daily at 9:00 a.m. and closes 4:00 p.m. every day except Friday. On Fridays the museum is open to 9:00 p.m. Food service areas are open weekdays 11:00 a.m. to 3:00 p.m.; weekends to 4:00 p.m.

The Museum Library is open 9:00 a.m. to 4:00 p.m. Monday through Friday (closed Thanksgiving, Nov. 25). Please obtain pass at reception desk, first floor north.

Museum Telephone: *922-9410*

December
1976

Field Museum of Natural History Bulletin

Field Museum of Natural History Bulletin

December, 1976
Vol. 47, No. 11

Editor/Designer: **David M. Walsten**
Production: **Oscar Anderson**
Calendar: **Nika Semkoff**
Staff photographer: **Ron Testa**

CONTENTS

3 **Treasures of Tutankhamun**, traveling exhibit on view at Field Museum April 15 through August 15
By David Silverman

4 **Appointment Calendar for 1977** features photos of treasures from the tomb of King Tutankhamun

back cover **December at Field Museum**
Calendar of coming events

Field Museum of Natural History
Founded 1893

President and Director: **E. Leland Webber**

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COVER

Gold mummy mask of Egyptian king Tutankhamun, who died ca. 1325 B.C. The solid gold mask was placed over the head and shoulders of Tutankhamun's mummy. Decorated with colored glass, carnelian, lapis lazuli, quartz, feldspar, and obsidian. The features appear to be a likeness of the teenage king, verifiable from the mummy itself. The cobra and the vulture, symbols of royalty, adorn the striped headdress, while a false beard of divinity is attached to the chin. Engraved on the shoulders and back is a spell from the *Book of the Dead.* Height 56.5 cm. Photo by Lee Boltin. Reproduced courtesy of the Metropolitan Museum of Art, New York.

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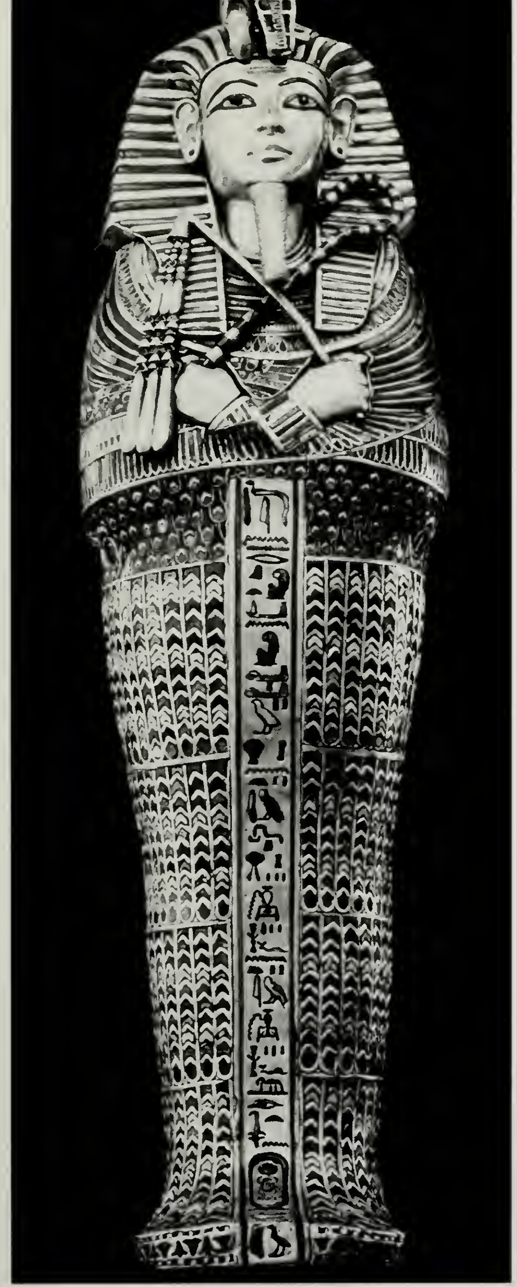


Photo by Lee Boltin; reproduced courtesy of the Metropolitan Museum of Art

Canopic coffin. This miniature inlaid gold coffin, originally containing the king's intestines, was placed in a compartment in the Canopic chest and covered by an elaborate stopper. It is decorated with carnelian and colored glass. The coffin was apparently made for Smenkhkara, Tutankhamun's predecessor and possibly his brother. The wings of the goddesses of Upper and Lower Egypt enfold the mummiform figure. The pharaoh holds the crook and flail scepters of Osiris, lord of the netherworld. Length 39.4 cm.

Treasures of Tutankhamun

Exhibit Opens at Field Museum April 15

By David P. Silverman

Whether you refer to him as Nebkheperura (his coronation name), Tutankhaton (his given name), Tutankhamun (his later name), or just King Tut (a short, modern version of the name), he is one of the most famous sovereigns of all time. Now he is about to become even more familiar to millions of Americans, as fifty-five of the most beautiful and best preserved artifacts from his tomb are displayed in museums across the United States. The two-year traveling exhibition includes a four-month showing at Field Museum.

A Bicentennial tribute to the American people from the people of Egypt, the exhibit was arranged by the Organization of Antiquities of the Egyptian government and the Metropolitan Museum of Art, New York. Entitled "Treasures of Tutankhamun," it will be seen at Field Museum, in cosponsorship with the Oriental Institute of the University of Chicago, from April 15 to August 15, 1977.

The tomb of this boy-king (who died around 1325 B.C. while still in his teens) was lost for thousands of years. Although ancient Egyptian tomb-robbers managed to locate and enter the tomb twice, loyal necropolis guards were able to prevent any serious looting. Through some stroke of fate, the final resealing of the entrance was successful, and the tomb eluded discovery until 1922. On November 4 of that year the intrepid British archaeologist Howard Carter, sponsored by the Earl of Carnarvon, uncovered the top of sixteen steps leading to the entrance of the tomb.

What Carter saw when he was finally able to peer through a small opening into the antechamber left him speechless. In the light of his candle, flickering in the centuries-old air, the strange shapes of images emerged from the gloom. Lord Carnarvon, standing behind Carter, inquired anxiously, "Can you see anything?" It was all Carter could do to reply, "Yes, wonderful things."

Although, as Carter commented, there was "everywhere the glint of gold," the treasures buried with Tutankhamun had a straightforward purpose: they were the necessities and the luxuries that the young king would need in order to make his afterlife as pleasant as the life he had enjoyed on earth. It is their very quantity and richness that make them so astounding to modern eyes. Some scholars have speculated that this magnificence, which may have been extraordinary for the Egyptians themselves, could have been the tribute of a grateful country to the king who had led them back to their traditional beliefs after the chaos of the preceding Amarna period.

The grace and naturalism of the figures are somewhat distinct from the more rigid style usually associated with Egyptian art. This new style originated in the Amarna period, when there was a tendency toward more lifelike representations and a freedom from convention. When Tutankhamun restored the age-old beliefs, the art reflected the return mainly in the subject matter; old gods regained their prominence. The style, however, still exhibited much of the Amarna realism. Coupled with it is a new balance and harmony, characteristics that the young king hoped would signify his reign. ☐

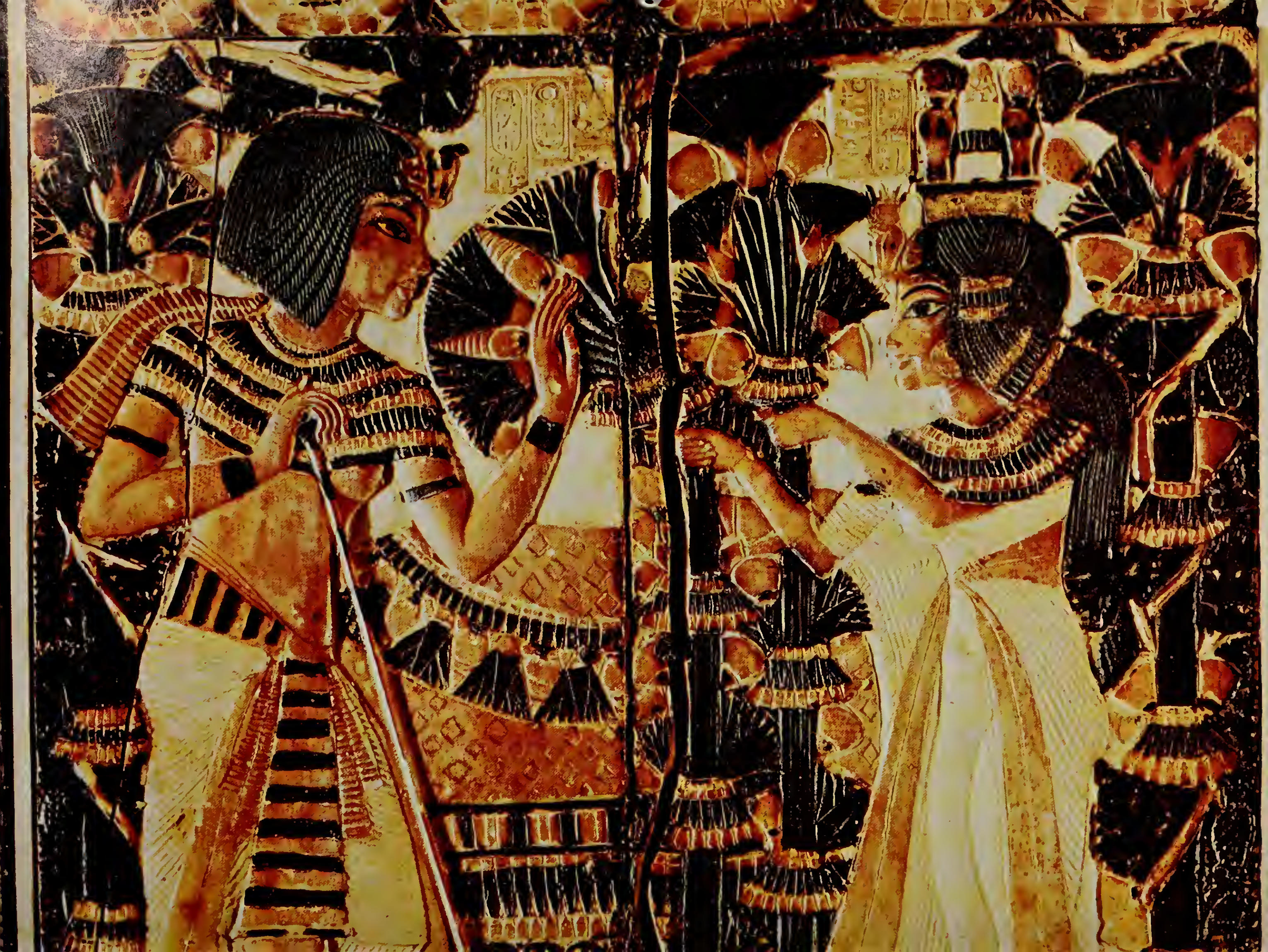
David P. Silverman is the project Egyptologist for the "Treasures of Tutankhamun" exhibition.

JANUARY 1977

worn by Tutankhamun when he was a child. A large scarab beetle made of lapis lazuli is the central figure; the scarab was a symbol of the sun god. Lapis lazuli, a semiprecious stone not found in Egypt, was probably imported from the area of present-day Afghanistan. Diameter 5.5 cm.

Field Museum of
Natural History

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Dec. 1976 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	February 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	*Volunteers needed during Tutankhamun exhibit; call 922-941:, ext. 247 for info*				1 **New Year's Day** *Museum closed*
2	3	4 *Winter adult courses begin*	5	6 *Winter adult courses begin*	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23 30	24 31	25	26	27 *"Sabata Komachi" Japanese noh drama for h. school and college groups, 3 perfs., by reserv. only*	28	29



FEBRUARY 1977

Painted ivory chest (detail). This elaborately inlaid chest is a technical and artistic masterpiece; its ivory reliefs are exceptionally refined in both their carving and painting. Wood, alabaster, bronze or copper, and calcite are also used in the construction. The front panel shows Tutankhamun and his queen, Ankhesenamun, hunting, while the sides and back depict running and fighting animals. The lid portrays the royal pair in a garden. The chest's overall shape is reminiscent of a shrine. Chest height 53 cm.

Photo by Lee Boltin; reproduced courtesy of the Metropolitan Museum of Art

Field Museum of Natural History

January						
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9	10	11	12	13	14	15
16	17	18	19	20	21	22
23/30	24/31	25	26	27	28	29

March						
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13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		1 *Visit "The Place for Wonder," ground floor; weekdays 1-3 p.m. weekends 10 a.m.-4 p.m.*	2	3	4	5
6	7	8	9	10	11	12 **Lincoln's Birthday**
13	14 **Valentine's Day**	15	16	17	18	19
20	21 **President's Day***	22 **Shrove Tuesday** **Washington's Birthday***	23 **Ash Wednesday** *Volunteer training for "Tut" exhibit begins*	24 *Volunteer training for "Tut" exhibit begins*	25	26 *Volunteer training for "Tut" exhibit begins*
27	28					

* *The observance of Washington's birthday as legal holiday on Feb. 22 began in 1796. In many states, however, his birthday is now celebrated on the 3rd Monday of Feb., designated President's Day*

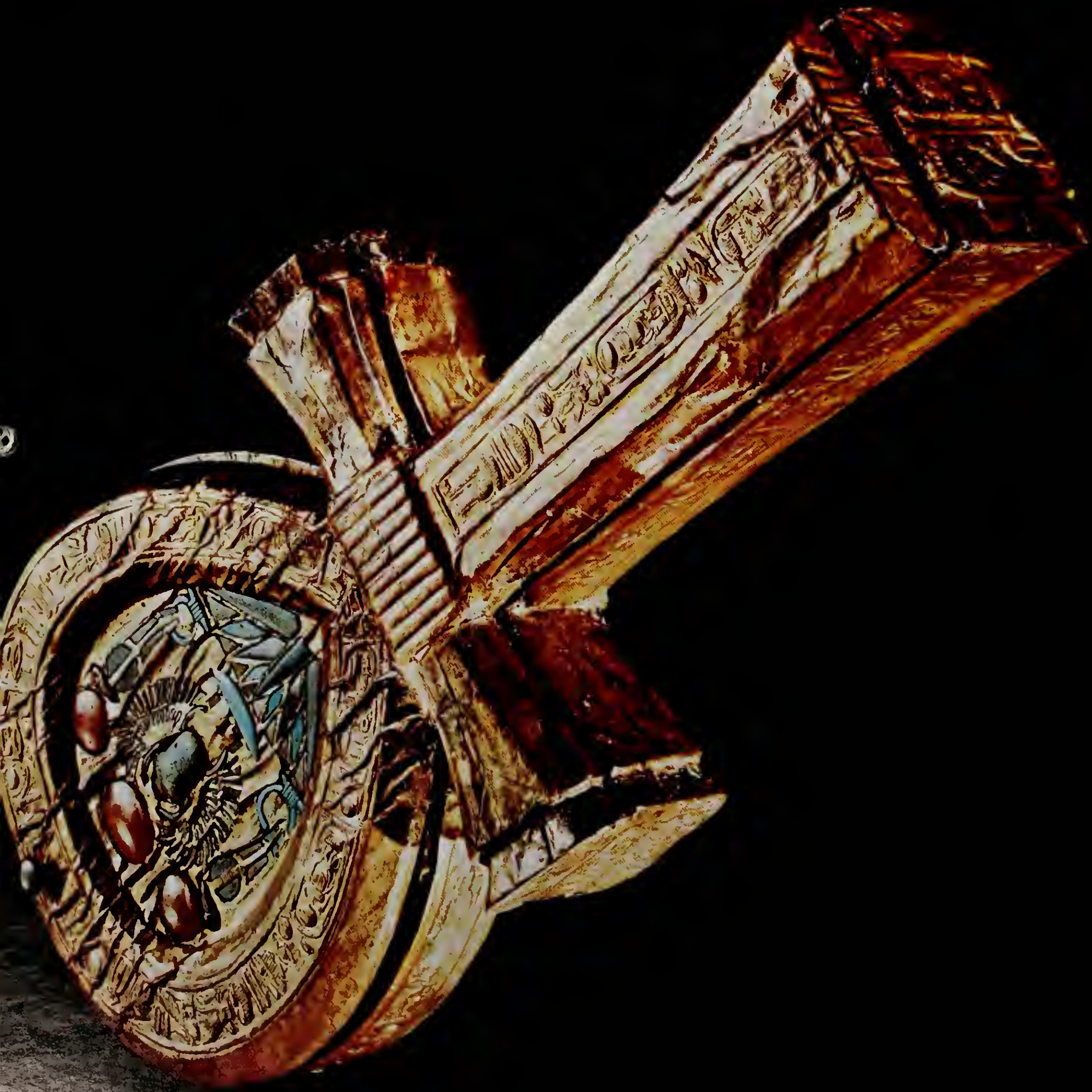
MARCH 1977

headrest. The curved support of this ivory, wood, and gold headrest is upheld by Shu, the god of air. Just as Shu raises the sky above the earth, here he will elevate the head of the king. The lions represent the mountains on the eastern and western horizons and identify the base as the earth. Height 17.8 cm.

Photo by Lee Boltin; reproduced courtesy of the Metropolitan Museum of Art

Field Museum of
Natural History

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
February 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	April 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	1 *New "Journey" available*	2	3	4 *Register now for spring adult courses*	5 *Ayer lecture 2:30 p.m.; Dr. Twomey: "Arizona"*
6	7	8	9	10	11	12 *Ayer lecture 2:30 p.m.; W. Sylvester: "Sea Adventure to Adriatic"*
13	14	15	16	17 **St. Patrick's Day**	18 1130 1300	19 *Ayer lecture 2:30 p.m.; D. Jones: "London"*
20	21	22	23	24	25	26 *Ayer lecture 2:30 p.m.; K. Muller: "Huichol—Tribe of the Sacred Cactus"*
27	28	29 Bus ticket *Tutankhamun members' lect. 8 p.m.; C. Desroches-Noblecourt: "Discovery of the Tomb"*	30	31		



APRIL 1977

Mirror case. The case is in the shape of an *ankh*, the sign for life. It is constructed of wood, sheet gold, silver, colored glass, carnelian, and quartz. The upper part of the *ankh* becomes a cartouche ring enclosing the king's throne name, Nebkheperura. Robbers probably stole the reflector, which would have been polished metal. Length 26.7 cm.

Photo by Lee Boltin; reproduced courtesy of the Metropolitan Museum of Art

Field Museum of
Natural History

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
March 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	May 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31			**Ancient Egypt** *film shown daily, 11 a.m., 12:00, 1:00, 2:00, 3:00*	1 *Tutankhamun pub. lect. 8 p.m.; C. Desroches-Noblecourt: "Discovery of the Tomb"*	2 *Ayer lecture 2:30 p.m.; T. Soule: "The Andes"*
3 **Passover Palm Sunday**	4	5	6	7	8 **Good Friday**	9 *Ayer lecture 2:30 p.m.; W. Hall: "The Real Yellowstone"*
10 **Easter**	11	12	13	14	15 *"Treasures of Tutankhamun" Exhibition opens*	16 *Ayer lecture 2:30 p.m.; S. Waterman, "Chambers of the Sea"*
17	18	19 *Spring adult courses begin* *Tutankhamun members' lect., 8 p.m.; D. B. Redford: "The Amarna Period"*	20 *Spring adult courses begin.*	21	22 *Tutankhamun pub. lect. 8 p.m.; D. B. Redford: "The Amarna Period"*	23 **Native American Day** *Members' field trip to Horicon Marsh, Wis.* *Ayer lecture 2:30 p.m.; W. Berlet: "America's Heartland—The Great River Story"*
24	25	26	27	28	29	30 *Ayer lecture 2:30 p.m.; N. Rettig: "Birds of Prey"*

MAY 1977

Gaming board. Two games, "passing" and "thieves," could be played on this reversible ivory and ebony board. Four sets of board games were discovered in Tutankhamun's tomb, so it is likely that he enjoyed board games. This board is the largest and most elegant. The playing pieces displayed here may have belonged to another set, however. Length 54.6 cm.

Photo by Lee Boltin; reproduced courtesy of the Metropolitan Museum of Art

Field Museum of
Natural History

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1 **Ancient Egypt** *film shown daily, 11 a.m., 12:00, 1:00, 2:00, 3:00*	2 *Field Museum's present bldg formally opened 1921*	3	4	5	6	7 *Environmental field trip*
8 **Mother's Day** *Environmental field trip*	9	10 *Tutankhamun members' lecture 8 p.m.; K. Baer: "The Reign of Tutankhamun"*	11	12	13 *Tutankhamun public lecture 8 p.m.; K. Baer: "The Reign of Tutankhamun"*	14 *Environmental field trip*
15 *Environmental field trip*	16	17	18	19	20	21 *Environmental field trip*
22 *Environmental field trip*	23	24	25	26	27	28
29	30 **Memorial Day**	31			April 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	June 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

JUNE 1977

Openwork plaque. The young king is portrayed here in the traditional role of a warrior returning from battle. In front of his chariot are shackled Asian and Nubian captives. The vulture and winged cobra goddesses of Upper and Lower Egypt protect the king. The plaque, in red-hued gold, may be a buckle. Height 6 cm.

Photo by Lee Boltin; reproduced courtesy of the Metropolitan Museum of Ar

Field Museum of
Natural History

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
May 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	July 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24/31 25 26 27 28 29 30	*Check monthly Bulletin for special events* **Ancient Egypt** *film shown daily, 11 a.m., 12:00, 1:00, 2:00, 3:00*	1 *New "Journey" available*	2 *Field Museum first formally opened, Jackson Park, 1894*	3	4 *Environmental field trip*
5 *Environmental field trip*	6	7 *Tutankhamun members' lecture 8 p.m.; J. Harris: "X-raying the Royal Mummies of the 18th Dynasty"*	8	9	10 *Tutankhamun public lecture 8 p.m.; J. Harris: "X-raying the Royal Mummies of the 18th Dynasty"*	11 *Environmental field trip*
12 *Environmental field trip*	13	14 **Flag Day**	15	16	17	18 *Environmental field trip*
19 **Father's Day** *Environmental field trip*	20	21 *Tutankhamun members' lecture 8 p.m.; N. Scott: "Daily Life in Ancient Egypt—18th Dynasty"*	22	23	24 *Tutankhamun public lecture 8 p.m.; N. Scott: "Daily Life in Ancient Egypt — 18th Dynasty"*	25
26	27	28	29	30		

JULY 1977

king wrapped in a shroud, lying on his funerary bed with two falcons, whose wings are folded over him. One of the birds has a human head and probably represents the spirit of the deceased king. According to the inscriptions on the bier, the object was a gift of Maya, the superintendent of the treasury. Height 38.1 cm.

Field Museum of
Natural History

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
June 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	August 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	*Highlight tours weekdays 2 p.m.*		**Ancient Egypt** *film shown daily, 11 a.m., 12:00, 1:00, 2:00, 3:00*	1	2
3	4 Independence Day	5	6	7	8	9
10	11	12 *Tutankhamun members' lecture 8 p.m.; J. Cooney, "Decorative Arts of Egypt"*	13	14	15 *Tutankhamun public lecture 8 p.m.; J. Cooney, "Decorative Arts of Egypt"*	16
17	18	19	20	21	22	23
24 / 31	25	26	27	28	29	30

AUGUST 1977

Tutankhamun's mummy, was probably worn by him during his lifetime. The pendant, representing Nekhbet, the vulture goddess of Upper Egypt, is made of solid gold encrusted with colored glass. The eye is of obsidian, the beak of lapis lazuli. The chain is of gold and lapis lazuli. Height of pendant 7 cm.

Field Museum of
Natural History

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Check monthly Bulletin for special events **Ancient Egypt** *film shown daily, 11 a.m., 12:00, 1:00, 2:00, 3:00* *Highlight tours weekdays 2 p.m.*	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
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July

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September

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4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
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SEPTEMBER 1977

Portable chest. This is the only surviving Egyptian chest with retractable carrying poles. Construction materials include wood, ivory, and bronze. Outlining the box and lid are hieroglyphs of a funerary nature—utterances of the gods and prayers. The front panel bears a carved relief of Tutankhamun making offerings to a god of the dead. Length 83.2 cm.

Photo by Lee Boltin; reproduced courtesy of the Metropolitan Museum of Art

Field Museum of
Natural History

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
August 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	October 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23/30 24/31 25 26 27 28 29		*Register now for fall adult courses* *Volunteer opportunities available. Write: Education—"Volunteer Brochure" for listing.*	1 *New "Journey" available*	2	3
4	5 **Labor Day**	6	7	8	9	10 *Environmental field trip*
11 *Environmental field trip*	12	13 **Rosh Hasbana** *(Jewish New Year)*	14	15	16 *Field Museum gets first charter as Columbian Museum of Chicago, 1893*	17 *Environmental field trip*
18 *Environmental field trip*	19	20	21	22 **Yom Kippur**	23	24 *Environmental field trip*
25 *Environmental field trip*	26	27	28	29	30	

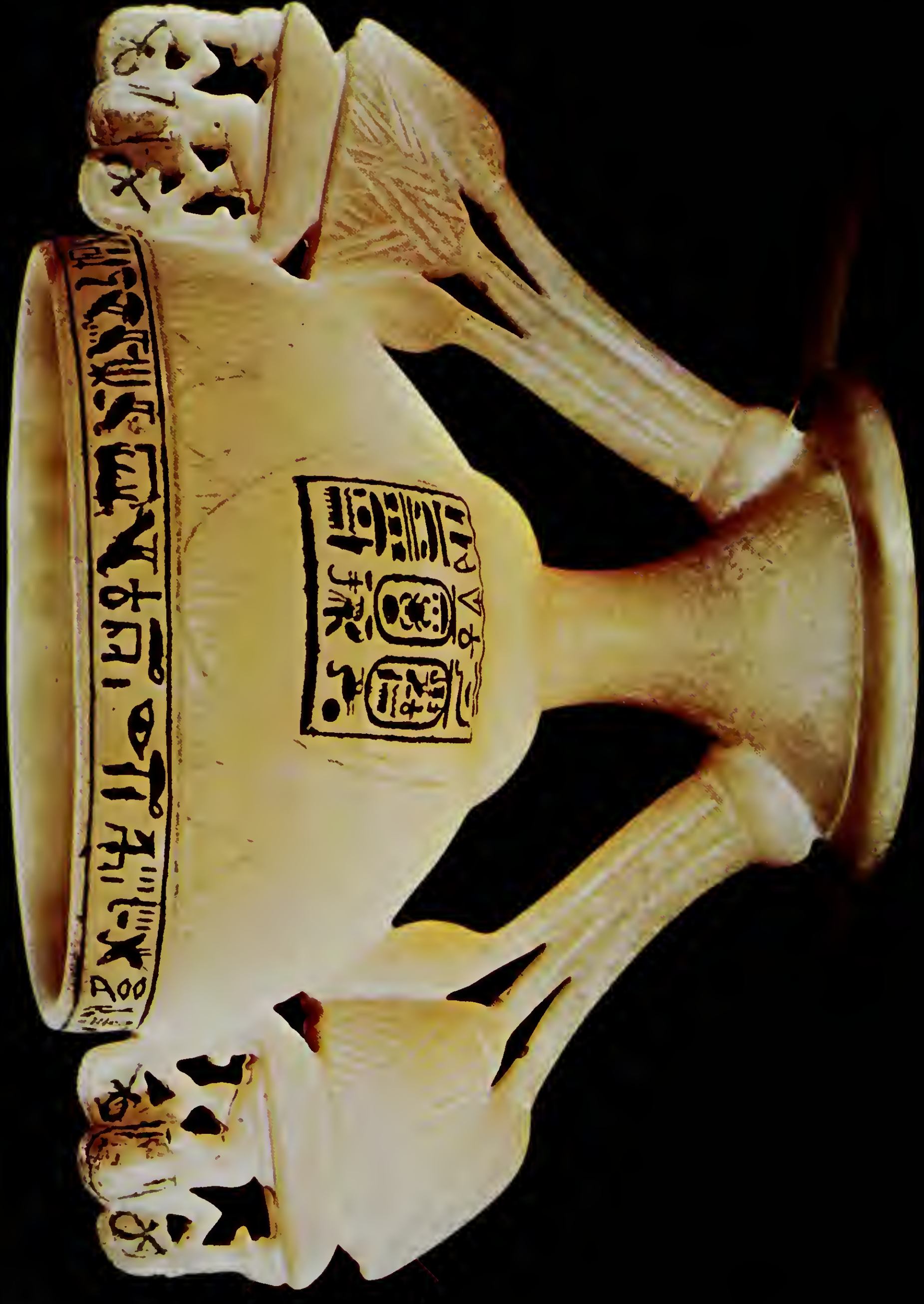
OCTOBER 1977

Dagger and sheaths. The hilt of the dagger is unusual in having bands of fine granulated gold alternating with bands of precious stone and colored glass inlay. The sheath, inlaid in a feather pattern on the front, has a scene of animals in combat embossed on the back. Dagger length 32.4 cm.

Photo by Lee Boltin; reproduced courtesy of the Metropolitan Museum of A

Field Museum of
Natural History

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
September 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	November 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30					1 *Members' childrens workshops* *Ayer lecture 2:30 p.m.* *Environmental field trip*
2 *Environmental field trip*	3	4	5	6 MEMBERS' NIGHT	7 MEMBERS' NIGHT	8 *Members' childrens workshops* *Ayer lecture 2:30 p.m.* *Environmental field trip*
9 *Environmental field trip*	10 Columbus Day	11 *Fall adult courses begin*	12	13 *Fall adult courses begin*	14	15 *Members' childrens workshops* *Ayer lecture 2:30 p.m.* *Environmental field trip*
16 *Environmental field trip*	17	18	19	20	21	22 *Members' childrens workshops.* *Ayer lecture 2:30 p.m.*
23 30	24 Veterans Day Halloween 31	25	26	27	28	29 *Members' childrens workshops* *Ayer lecture 2:30 p.m.*



NOVEMBER 1977

Lotiform chalice. Carved of a single piece of alabaster, this chalice is in the form of a white lotus blossom. The handles are blue lilies supporting the god of eternity, Heh. The inscription around the rim partially reads, "May your Ka live and may you spend millions of years—you who love Thebes—sitting with your face to the north wind, your eyes beholding happiness." Height 17.8 cm.

Photo by Lee Boltin; reproduced courtesy of the Metropolitan Museum of Art

Field Museum of
Natural History

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
October 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23/30 24/31 25 26 27 28 29	December 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1	2	3	4	5 *Ayer lecture 2:30 p.m.*
6	7	8 **Election Day**	9	10	11	12 *Ayer lecture 2:30 p.m.*
13	14	15	16	17	18	19 *Ayer lecture 2:30 p.m.*
20	21	22	23	24 **Thanksgiving**	25	26 *Ayer lecture 2:30 p.m.*
27	28	29	30			*Christmas shop early in new Museum store*

DECEMBER 1977

Broad collar. This flexible gold collar, composed of 250 inlaid segments and decorated with colored glass and obsidian, was placed around the neck of Tutankhamun's mummy. The vulture goddess Nekhbet, associated with Upper Egypt, was one of the pharaoh's protective deities. In each claw she grasps a *shen*, symbol of infinity. Height 39.4 cm.

Photo by Lee Boltin; reproduced courtesy of the Metropolitan Museum of A

Field Museum o
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November 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	Jan. 1978 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31		*Register now for winter adult courses* *Take family or friends to "The Place of Wonder," ground floor.*	1 *New "Journey" available*	2	3
4	5 **Hanukkah**	6	7	8	9	10
11	12	13	14	15	16	17
18	19 *Highlight tour 2 p.m.*	20 *Highlight tour 2 p.m.*	21 *Highlight tour 2 p.m.*	22 *Highlight tour 2 p.m.*	23	24
25 **Christmas Day** *Museum closed*	26	27	28	29	30	31

December at Field Museum

SPECIAL PROGRAMS

Ray A. Kroc Environmental Education Program: *Living Among Whales.* Sunday, Dec. 5, 2:30 p.m., Roger Payne presents a lecture/film about the rare right whale; 5 years studying a right whale colony has afforded an unusual view of these marine giants. *Simpson Theatre, ground floor.*

Holiday Season Choral Performance. Sunday, Dec. 19, 2 p.m., Seaford College Chapel choir, of England, performs liturgical music ranging from plainsong hymn to Stravinsky. *Stanley Field Hall.*

Museum Highlight Tours. December 27 through 30, education staff and volunteers lead tours through anthropological and natural science exhibits. Meet at information booth, 2 p.m.

Adult Education Program: Winter Series. Begins the first week in January with 10 natural science and anthropology courses. Series brochures were mailed to all Chicago-area members. For additional information call 922-9410, ext. 360 or 362.

Man in His Environment Film Series. Films are shown at 11 a.m. and 1 p.m. Meeting Room, 2nd floor north.

The December theme is "The Question of Tomorrow: Documentary and Fantasy Versions of What the Future Can Hold For Us."

Dec. 3, 4, 5: *Energy: New Sources*
Man and the Second Industrial Revolution

Dec. 10, 11, 12: *Future Shock*

Dec. 17, 18, 19: *Superconductors: Tomorrow's Energy Breakthrough is Here*
Jetspeed at Ground Zero. Supercool Superconductors

Dec. 24, 26: *City*

Winter Journey for Children: *All that Glitters.* Throughout the ages, gold and silver have made poor men rich, built their empires, and filled everyone's teeth. A free, self-guided tour explores these elements and their properties. All children who can read and write are invited to participate; families will enjoy it too. Journey sheets available at information booth.

Egypt 1978

Several tours to Egypt are planned for January, February, and March of 1978. Watch for additional information in future issues of the Bulletin.

SPECIAL EXHIBITS

I Wear the Morning Star. Exhibit of garments and objects designed by Western Plains Indians for the Ghost Dance, a pacifistic religious movement borne of one man's impressive visions and adapted by 30 tribes in the late 19th century. Hall 9. Through Feb. 6.

Male and Female: Anthropology Game. This exhibit of 38 artifacts is a great way to learn that economic and social roles of the sexes are not universally the same. South Lounge, 2nd floor. No closing date.

Man in His environment takes a global view of some of the most serious environmental problems confronting all mankind and asks visitors to involve themselves in these problems—and the need for solution. Hall 18. No closing date.

Pliny's Natural History: The First Encyclopedia. Two rare editions (1513 and 1530) of Pliny the Elder's work—viewed today as an astonishing mixture of fact and fiction—are on view in the South Lounge, 2nd floor. No closing date.

Pterosaur. A stylized model of the largest known flying creature—an extinct pterosaur—dramatizes a special exhibit of pterosaur fossils; Northwest Arcade, 2nd floor. No closing date.

CONTINUING PROGRAMS

The Ancient Art of Weaving. Members of the North Shore Weavers' Guild demonstrate weaving and spinning every Monday, Wednesday, and Friday, 10 a.m. to 12 p.m. South Lounge, 2nd floor. Through Dec. 17, 1976. (Demonstrations resume Jan. 17.)

Saturday Discovery Programs. Saturdays, 11 a.m. to 3 p.m.; take tours, follow demonstrations, participate in museum-related activities.

SPECIAL-INTEREST MEETINGS OPEN TO THE PUBLIC

Dec. 3, 8:00 p.m.	*Chicago Anthropological Society*
Dec. 7, 7:30 p.m.	*Kennicott Club*
Dec. 8, 7:00 p.m.	*Chicago Ornithological Society*
Dec. 8, 7:30 p.m.	*Windy City Grotto, National Speleological Society*
Dec. 9, 8:00 p.m.	*Chicago Mountaineering Club*
Dec. 14, 7:30 p.m.	*Chicago Nature Camera Club*
Dec. 14, 8:00 p.m.	*Chicagoland Glider Council*
Dec. 21, 7:30 p.m.	*Chicago Audubon Society*

DECEMBER HOURS

The Museum Opens daily at 9 a.m., closes at 4 p.m. weekdays and 5 p.m. weekends. On Friday, year-round, the museum is open to 9 p.m. Food service areas are open weekdays 11 a.m. to 3 p.m., weekends to 4 p.m. The museum is closed Christmas Day and New Year's Day.

The Museum Library is open 9 a.m. to 4 p.m. Monday through Friday. Obtain pass at reception desk, main floor north.

Museum Telephone: 922-9410